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BEYOND SHU: INTEGRATING EFFICIENCY AND FINANCIAL PERFORMANCE OF COOPERATIVES IN INDONESIA

MELAMPAUI SHU: MENGINTEGRASIKAN EFISIENSI DAN KINERJA KEUANGAN KOPERASI DI INDONESIA

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Abstract

Cooperatives play an important role in supporting economic development and members' welfare; however, increases in cooperative capacity and financial performance are not necessarily accompanied by efficient resource utilization. This study aims to analyze the efficiency of cooperatives in Indonesia and identify factors associated with financial performance and the probability of cooperatives achieving an efficient condition. The study uses secondary data from 34 provinces in Indonesia over the period 2016–2023, comprising 272 observations. The analysis was conducted in three stages. First, Data Envelopment Analysis (DEA) was employed to measure relative efficiency using the number of members, capital, and business volume as inputs and Sisa Hasil Usaha (SHU), the surplus generated by cooperatives, as the output. Second, panel data regression was used to analyze financial performance measured by SHU. Third, binary logistic regression was employed to analyze the probability of cooperatives being in an efficient condition. The DEA results show that cooperative efficiency fluctuated, with the highest average score of 0.759 in 2019 and the lowest of 0.508 in 2022, before increasing to 0.751 in 2023. The panel data regression results indicate that the Lending Base Rate (SBDK) is negatively and significantly associated with SHU, while the number of members, capital growth, and productivity are positively and significantly associated with SHU. Meanwhile, the binary logistic regression results show that the number of members and productivity are positively and significantly associated with the probability of achieving efficiency, whereas capital growth is negatively and significantly associated with efficiency, while SBDK does not show a significant association. These findings indicate that financial performance and efficiency are two related but distinct dimensions of cooperative performance. The findings imply that increasing financial capacity through capital growth needs to be accompanied by improvements in productivity and the ability to convert resources into output proportionally. Therefore, strengthening cooperatives should not focus solely on increasing resources and SHU, but also on optimizing resource utilization to improve efficiency.

Keywords : Cooperatives, Data Envelopment Analysis, Panel Data Regression, Binary Logistic Regression, Efficiency, Sisa Hasil Usaha (SHU), SBDK, Number of Members, Capital Growth, Productivity.

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Abstrak

Koperasi memainkan peran penting dalam mendukung pembangunan ekonomi dan kesejahteraan anggotanya; namun, peningkatan kapasitas dan kinerja keuangan koperasi tidak selalu dibarengi dengan pemanfaatan sumber daya yang efisien. Studi ini bertujuan untuk menganalisis efisiensi koperasi di Indonesia serta mengidentifikasi faktor-faktor yang berkaitan dengan kinerja keuangan dan probabilitas koperasi dalam mencapai kondisi efisien. Penelitian ini menggunakan data sekunder dari 34 provinsi di Indonesia selama periode 2016–2023, dengan total 272 observasi. Analisis dilakukan dalam tiga tahap. Pertama, Data Envelopment Analysis (DEA) digunakan untuk mengukur efisiensi relatif dengan menggunakan jumlah anggota, modal, dan volume usaha sebagai input, serta Sisa Hasil Usaha (SHU) surplus yang dihasilkan oleh koperasi sebagai output. Kedua, regresi data panel digunakan untuk menganalisis kinerja keuangan yang diukur melalui SHU. Ketiga, regresi logistik biner digunakan untuk menganalisis probabilitas koperasi berada dalam kondisi efisien. Hasil DEA menunjukkan bahwa efisiensi koperasi berfluktuasi, dengan skor rata-rata tertinggi sebesar 0,759 pada tahun 2019 dan terendah sebesar 0,508 pada tahun 2022, sebelum meningkat kembali menjadi 0,751 pada tahun 2023. Hasil regresi data panel menunjukkan bahwa Suku Bunga Dasar Kredit (SBDK) memiliki hubungan negatif dan signifikan terhadap SHU, sementara jumlah anggota, pertumbuhan modal, dan produktivitas memiliki hubungan positif dan signifikan terhadap SHU. Di sisi lain, hasil regresi logistik biner menunjukkan bahwa jumlah anggota dan produktivitas berhubungan positif dan signifikan terhadap probabilitas pencapaian efisiensi; sebaliknya, pertumbuhan modal berhubungan negatif dan signifikan terhadap efisiensi, sementara SBDK tidak menunjukkan hubungan yang signifikan. Temuan ini mengindikasikan bahwa kinerja keuangan dan efisiensi merupakan dua dimensi kinerja koperasi yang saling berkaitan namun berbeda. Hasil penelitian ini menyiratkan bahwa peningkatan kapasitas keuangan melalui pertumbuhan modal harus dibarengi dengan peningkatan produktivitas serta kemampuan untuk mengubah sumber daya menjadi output secara proporsional. Oleh karena itu, penguatan koperasi tidak boleh hanya berfokus pada penambahan sumber daya dan peningkatan SHU, tetapi juga pada optimalisasi pemanfaatan sumber daya guna meningkatkan efisiensi.

Kata Kunci : Koperasi, Analisis Selubung Data (Data Envelopment Analysis), Regresi Data Panel, Regresi Logistik Biner, Efisiensi, Sisa Hasil Usaha (SHU), Suku Bunga Dasar Kredit (SBDK), Jumlah Anggota, Pertumbuhan Modal, Produktivitas.

1. INTRODUCTION

Cooperatives are economic organizations that play a role in improving the well-being of their members and supporting community-based economic development. As organizations with a dual nature, cooperative members serve as both owners and service users; thus, a cooperative's success is determined not only by its ability to generate financial performance but also by its ability to manage resources optimally (International Co-operative Alliance, 1995; Marwa & Aziakpono, 2014; Puusa et al., 2013). In Indonesia, the number of active cooperatives in 2023 reached 131,629 units with 28,927,838 members. However, this growth is still accompanied by challenges related to limited capital, managerial capacity, and operational efficiency, which result in performance disparities across regions (Ministry of Cooperatives, 2017, 2026; Hasan et al., 2018).

A cooperative's performance can be assessed by its ability SHU as well as its ability to optimize the resources it uses. The number of members, capital, and business volume are internal factors that play a role in cooperative activities. However, previous research findings indicate that the relationships are not always consistent. Majid et al. (2022) found that business volume is positively correlated with productivity, while the number of members and debt show a negative correlation. Conversely, Pham (2022) found that capital and membership size are positively correlated with cooperative performance.

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These differences indicate that the size of resources does not necessarily result in optimal performance if it is not accompanied by productive management.

In addition to internal factors, a cooperative's performance can also be influenced by the external environment. From a PESTEL perspective, economic conditions are one of the external environmental factors that can influence an organization (Johnson et al., 2017). One relevant indicator is the Base Lending Rate (BLR), as changes in interest rates can affect financing costs, access to capital, and competition between cooperatives and banking institutions. Previous research has also shown that socioeconomic factors and external policies may be related to cooperative performance (Hiep et al., 2025; Singh et al., 2019).

Although research on cooperative performance has expanded, there are still limitations in integrating internal and external factors and distinguishing between financial performance and efficiency. Some studies use a single approach, such as DEA or panel regression, and thus have not simultaneously demonstrated cooperatives' ability to generate financial output and optimize resources. Therefore, this study integrates Data Envelopment Analysis (DEA), panel data regression, and binary logistic regression. DEA is used to measure the relative efficiency of cooperatives, panel data regression is used to analyze factors related to net income, while logistic regression is used to analyze factors related to the probability of a cooperative achieving an efficient state.

This study uses data from 34 provinces in Indonesia for the period 2016–2023, comprising 272 observations. The study aims to analyze the efficiency levels of cooperatives, identify factors related to net income, and analyze factors related to the probability that a cooperative is operating efficiently. The contribution of this study lies in the integration of efficiency and financial performance analyses to demonstrate that the ability to generate net income is not always synonymous with the ability to use resources efficiently.

2. RESEARCH METHOD

This study employs a quantitative approach using secondary data at the provincial level. The units of analysis are cooperatives in 34 provinces in Indonesia, with an observation period from 2016 to 2023, resulting in 272 observations that represent a combination of spatial and temporal dimensions. Data on the number of members, capital, business volume, and SHU were obtained from publications by the Ministry of Cooperatives and related statistical sources, while data on the Base Lending Rate (BLR) were obtained from the Financial Services Authority (OJK). The data were then harmonized by province and year to form the research dataset.

The variables used consist of the number of members, capital, business volume, SHU, SBDK, and productivity. In measuring efficiency, the number of members, capital, and business volume are used as inputs, while SHU is used as the output. For the regression analysis, SHU is used as the dependent variable in the panel data model, while SBDK, the number of members, capital growth, and productivity are used as independent variables. In the logistic regression model, the DEA efficiency results were transformed into a binary variable, with a value of 1 for provinces with a DEA score of 1 and a value of 0 for those with a DEA score of less than 1.

The analysis was conducted in three stages. The first stage used Data Envelopment Analysis (DEA) to measure the relative efficiency of cooperatives across provinces based on a combination of inputs number of members, capital, and business volume—in generating net income. DEA was used because it is a nonparametric approach capable of simultaneously measuring efficiency across multiple inputs and outputs.

The second stage uses panel data regression to analyze the relationship between SBDK, number of members, capital growth, and productivity with SHU. The panel model was selected using the Chow, Hausman, and Lagrange Multiplier (LM) tests. The third stage uses binary logistic regression to analyze the relationship between SBDK, number of members, capital growth, and productivity with the probability that a province is in an efficient state. Logistic regression estimates were performed using the Maximum Likelihood method with the Binary Logit approach.

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Overall, the integration of these three methods was used to obtain a more comprehensive picture of cooperatives, namely through the measurement of relative efficiency (DEA), an analysis of factors related to financial performance using SHU (panel data regression), and an analysis of factors related to the probability of achieving an efficient state (binary logistic regression). Data processing was performed using the software employed in this study: MaxDEA for DEA analysis and EViews for econometric analysis.

3. RESULT AND DISCCUSSION

Cooperative Efficiency Based on Data Envelopment Analysis (DEA)

Table 1. DEA Efficiency Scores for Cooperatives by Province, 2016–2023

Province	2016	2017	2018	2019	2020	2021	2022	2023
Aceh	0,434	0,663	0,719	0,951	1,000	1,000	0,263	0,610
Sumatera Utara	0,858	0,725	0,514	1,000	0,826	0,896	0,688	0,848
Sumatera Barat	0,582	0,795	1,000	1,000	0,639	0,623	0,401	0,687
Riau	1,000	1,000	0,570	0,738	0,577	0,619	0,576	1,000
Jambi	0,766	0,809	0,759	0,992	0,565	0,587	0,165	0,747
Sumatera Selatan	0,409	0,662	0,657	0,769	0,494	0,438	0,256	0,644
Bengkulu	0,587	0,804	0,794	0,797	0,618	0,510	0,320	0,752
Lampung	0,695	0,603	0,671	0,875	0,536	0,584	0,400	0,680
Kep. Bangka Belitung	0,407	0,557	0,461	0,567	0,372	0,445	0,296	0,857
Kep. Riau	0,545	0,770	0,640	1,000	0,698	0,601	0,313	0,524
DKI Jakarta	1,000	1,000	0,814	1,000	1,000	1,000	1,000	1,000
Jawa Barat	1,000	0,905	0,662	0,819	0,816	0,937	0,945	1,000
Jawa Tengah	0,535	0,444	0,481	0,542	0,566	0,627	0,569	0,561
D.I. Yogyakarta	0,221	0,303	0,264	0,405	0,374	0,322	0,205	0,318
Jawa Timur	0,937	0,786	0,933	1,000	1,000	1,000	1,000	1,000
Banten	0,731	0,865	0,660	1,000	0,858	0,857	0,552	0,929
Bali	0,384	0,682	0,357	0,623	0,634	0,585	0,424	0,629
Nusa Tenggara Barat	0,591	0,660	0,592	0,678	0,503	0,460	0,251	0,544
Nusa Tenggara Timur	0,370	0,369	0,252	0,388	0,244	0,218	0,235	0,393
Kalimantan Barat	0,319	0,239	0,205	0,318	0,283	0,384	0,408	0,395
Kalimantan Tengah	1,000	0,468	0,214	0,544	0,481	0,427	0,347	1,000
Kalimantan Selatan	0,889	1,000	1,000	1,000	0,631	0,951	0,403	1,000
Kalimantan Timur	0,580	0,901	0,660	0,643	0,273	0,293	0,516	1,000

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Province	2016	2017	2018	2019	2020	2021	2022	2023
Kalimantan Utara	1,000	1,000	0,943	0,767	0,651	0,761	0,478	0,621
Sulawesi Utara	0,602	0,730	0,612	0,621	0,447	0,503	0,406	0,714
Sulawesi Tengah	0,865	0,971	0,724	0,723	0,481	0,249	0,143	0,390
Sulawesi Selatan	1,000	1,000	0,827	0,767	0,541	0,512	0,327	0,517
Sulawesi Tenggara	0,619	0,500	0,662	0,697	0,535	0,666	1,000	0,807
Gorontalo	0,594	0,512	0,498	0,631	0,476	0,469	0,370	0,615
Sulawesi Barat	0,729	0,735	1,000	0,551	0,529	0,457	1,000	1,000
Maluku	0,393	1,000	0,560	0,607	0,486	0,598	0,511	0,892
Maluku Utara	1,000	1,000	1,000	1,000	1,000	0,957	1,000	1,000
Papua Barat	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Papua	1,000	0,722	0,790	0,787	0,637	0,467	0,503	0,856

Source: Research data, processed by the researcher (2026)

The results of the Data Envelopment Analysis (DEA) indicate that the efficiency levels of interprovincial cooperatives in Indonesia fluctuated during the 2016–2023 period. DEA scores range from 0 to 1, with a score of 1 indicating that a province lies on the efficiency frontier, while a score below 1 indicates relative inefficiency in the use of inputs to generate net operating income. The analysis compares a combination of the number of members, capital, and business volume as inputs with SHU as the output.

Average efficiency stood at 0.695 in 2016 and rose to 0.741 in 2017. Subsequently, average efficiency declined to 0.662 in 2018 and reached a high of 0.759 in 2019. After that, efficiency declined to 0.618 in 2021 and hit a low of 0.508 in 2022, before rising to 0.751 in 2023. This pattern indicates that cooperatives' ability to convert resources into net operating income varies across periods and provinces.

The increase in efficiency in 2023 indicates an improvement in the cooperatives' relative ability to combine inputs to generate SHU compared to the situation in 2022. However, since DEA is a measure of relative efficiency, an increase in the score does not merely indicate an improvement in absolute performance but also reflects a change in a province's position relative to the frontier formed by the observation units in the sample.

Factors Related to SHU

Table 2. Results of the Regression Model Selection for Panel Data

Test	Probability	Decision
Chow Test	0.000	FEM is more appropriate than CEM
Hausman Test	0.332	REM is more appropriate than FEM
LM Test	0.000	REM is more appropriate than CEM

Source: Research data, processed by the researcher (2026)

Panel data regression analysis was conducted using 272 observations with the Random Effects Model (REM). The model selection was based on the results of the Chow, Hausman, and Lagrange Multiplier tests. The Chow test yielded a p-value of 0.000, the Hausman test 0.332, and the LM test 0.000; therefore, the REM was used in the final estimation.

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Table 3. Estimation Results for the Random Effects Model

Variable	Coefficient	p-value	Description
Constant	-572,286.20	0.0000	Significant
SBDK	-5,940.85	0.0091	Significant
Number of Members (JA)	0.12	0.0000	Significant
Capital Growth (PM)	44,787.66	0.0000	Significant
Productivity (Prod)	13,421.00	0.0000	Significant
R^2	0.563081		
Prob. F-statistic	0.0000		Significant

Source: Research data, processed by the researcher (2026)

$$SHU_{it} = -572.286,2 - 5.940,85\ SBDK_{it} + 0,12\ JA_{it} + 44.787,66\ PM_{it} + 13.421\ Prod_{it} + u_i + \varepsilon_{it}$$

The estimation results show that all independent variables have a significant relationship with SHU at a 5% significance level. SBDK has a negative coefficient of -5,940.85 with a p-value of 0.0091. In contrast, the number of members has a coefficient of 0.12, capital growth of 44,787.66, and productivity of 13,421, each with a p-value of 0.0000. The R^2 value of 0.5631 indicates that approximately 56.31% of the variation in SHU in the model can be explained by SBDK, the number of members, capital growth, and productivity.

The negative relationship between SBDK and SHU indicates that an increase in SBDK is associated with a decrease in SHU in the research model. A coefficient of -5,940.85 suggests that a one-percentage-point increase in SBDK is associated with a decrease in SHU of approximately Rp5,940.85 million, holding other variables constant. These findings suggest that financing conditions are one of the external factors associated with the financial performance of cooperatives.

Conversely, the number of members, capital, and productivity have a positive relationship with SHU. A larger number of members is associated with an increase in SHU, while capital growth is also associated with an increase in net income. Productivity shows a positive relationship with net income, indicating that the ability to generate economic output from available resources is linked to the cooperative's financial performance.

Factors Related to the Probability of Efficiency

Binary logistic regression analysis was used to analyze the factors associated with the probability that a cooperative is operating efficiently. The dependent variable was an efficiency dummy variable, which took a value of 1 for provinces with a DEA score of 1 and a value of 0 for provinces with a DEA score of less than 1. The model used SBDK, number of members, capital growth, and productivity as independent variables.

Table 4. Results of the Binary Logistic Regression

Variable	Coefficient	Odds Ratio	p-value	Description
SBDK	0.019123	1.019	0.7429	Not significant
Number of Members (JA)	3.94×10^{-7}	1.483	0.0062	Significant (+)
Capital Growth (PM)	-0.33144	0.718	0.0029	Significant (-)
Productivity (Prod)	0.1202	1.128	0.0022	Significant (+)

Source: Research data, processed by the researcher (2026)

The estimation results show that SBDK has a positive coefficient of 0.019123 with an odds ratio of 1.019 and a p-value of 0.7429. The positive coefficient indicates a positive direction of the relationship, but a p-value greater than 0.05 suggests that the relationship between SBDK and the probability of a cooperative being in an efficient state is not statistically significant. Thus, in this research model, there is not yet sufficient statistical evidence that changes in SBDK are related to changes in the probability of cooperative efficiency.

The number of members has a coefficient of 3.94×10^{-7}, with an odds ratio of 1.483 and a probability of 0.0062. A positive coefficient indicates a positive relationship between the number of members and the probability of efficiency. Using a change of 1 million members, the odds ratio of 1.483 indicates that an increase of 1 million members is associated with a 48.3% increase in the odds

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that a cooperative is operating efficiently, assuming all other variables remain constant. The probability value of 0.0062, which is less than 0.05, indicates that this relationship is statistically significant.

Capital growth has a coefficient of -0.331440, with an odds ratio of 0.718 and a probability of 0.0029. The negative coefficient indicates that an increase in capital growth is associated with a decrease in the odds that a cooperative is operating efficiently. An odds ratio of 0.718 indicates that a one-unit increase in the capital growth variable is associated with odds of efficiency that are approximately 28.2% lower, assuming all other variables remain constant. The probability value of 0.0029 indicates that this relationship is statistically significant.

Furthermore, productivity has a coefficient of 0.120200, with an odds ratio of 1.128 and a probability of 0.0022. A positive coefficient indicates a positive relationship between productivity and the probability of efficiency. An odds ratio of 1.128 indicates that a one-unit increase in productivity is associated with a 12.8% increase in the odds that a cooperative is operating efficiently, assuming all other variables remain constant. The probability value of 0.0022 indicates that this relationship is statistically significant.

Overall, the results of the binary logistic regression indicate that the number of members and productivity have a positive and significant relationship with cooperative efficiency, whereas capital growth has a negative and significant relationship. Meanwhile, SBDK has a positive relationship, but it is not statistically significant. The Likelihood Ratio test results also show that the independent variables collectively have a significant relationship with efficiency, with a Prob(LR Statistic) value of 0.004045.

DISCUSSION

The research findings indicate that performance issues among cooperatives in Indonesia are not only related to their ability to generate SHU but also to their ability to manage their resources efficiently. This is evident from the results of the Data Envelopment Analysis (DEA), which show variations in efficiency across provinces and over the period from 2016 to 2023. The average efficiency score increased from 0.695 in 2016 to 0.741 in 2017, then fluctuated before reaching a low of 0.508 in 2022 and rising again to 0.751 in 2023. The number of provinces achieving an efficiency score of 1 also varied across periods, from 9 provinces in 2016 to 4 provinces in 2021, 6 provinces in 2022, and an increase to 10 provinces in 2023.

These fluctuations indicate that an increase in the aggregate activity and performance of cooperatives does not always go hand in hand with an increase in efficiency. In this study, DEA measures the ability of cooperatives to convert the number of members, capital, and business volume as inputs into SHU as an output. Thus, the efficiency score not only reflects the magnitude of SHU but also indicates how optimally these resources are utilized compared to the frontier formed by the units in the sample. This perspective aligns with production theory, which views output as the result of transforming various inputs, while efficiency theory emphasizes a unit's ability to produce output optimally from the resources it uses.

These DEA findings are significant when considered in relation to the evolution of cooperatives' financial performance. During the study period, aggregate SHU increased from approximately Rp2.71 trillion in 2016 to approximately Rp8 trillion in 2023. However, this increase in SHU did not result in a consistently rising pattern of efficiency. In fact, average efficiency hit a low point in 2022 before recovering in 2023. This situation indicates that growth in financial output does not, by itself, signify an increase in efficiency. In other words, cooperatives can generate increasingly larger SHU, but if the inputs used also increase at a greater rate or are not optimally converted into output, relative efficiency may remain low.

These findings were further clarified through the results of panel data regression. Model selection testing yielded a Random Effects Model (REM), with a Chow test statistic of 0.000, a Hausman test statistic of 0.332, and a Lagrange Multiplier test statistic of 0.000. The REM model shows that SBDK has a negative and significant relationship with SHU, while the number of members,

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capital growth, and productivity have positive and significant relationships with SHU. The correlation coefficient of 0.5631 indicates that approximately 56.31% of the variation in SHU within the model can be explained by the variables used.

The positive relationship between the number of members and SHU indicates that the membership base is a key source of a cooperative's economic activity. The nature of cooperatives in which members are both owners and service users means that an increase in membership expands the scope of the cooperative's business activities and transactions. These findings are consistent with those of Pham (2022), who identified a positive relationship between membership size and cooperative performance. However, these results differ from those of Majid et al. (2022), who found a negative relationship between the number of members and cooperative productivity. This discrepancy suggests that the impact of membership size may vary depending on the performance indicators used. In this study, the number of members was not only positively correlated with SHU but also showed a positive and significant relationship with the probability that a cooperative is operating efficiently in the logistic model.

This consistency is evident in the results of the binary logistic regression. The number of members has a positive coefficient of 3.94×10^{-7}, a probability of 0.0062, and an odds ratio of 1.483 when a change in the number of members is expressed as an increase of 1 million members. This indicates that an increase in the number of members is associated with an increase in the odds that a cooperative is operating efficiently. Thus, the results of the DEA, panel regression, and logistic regression provide a complementary picture: the DEA indicates variations in the cooperatives' ability to convert inputs into SHU; the panel regression shows that the number of members is associated with an increase in SHU; while the logistic regression indicates that the number of members is also associated with the likelihood of a cooperative achieving an efficient state.

A more interesting pattern is observed in capital. The panel regression results indicate that capital growth has a positive and significant relationship with SHU. This finding is consistent with production theory, which identifies capital as one of the inputs that can increase business capacity. These results are also consistent with Pham (2022), Singh et al. (2019), and Ndiege and Kazungu (2020), who highlight the importance of capital or capital structure for cooperative performance. However, when cooperative performance is viewed from an efficiency perspective, the results reveal a different pattern. The logistic regression yielded a capital growth coefficient of -0.331440 with a probability of 0.0029 and an odds ratio of 0.718. This means that a one-unit increase in capital growth is associated with a 28.2% decrease in the odds that a cooperative is operating efficiently, holding all other variables constant.

This difference in direction is one of the key findings of this study. Capital may be associated with an increase in SHU, but an increase in capital does not automatically lead to an increase in relative efficiency. This finding can be explained by efficiency theory, as efficiency is determined not only by the magnitude of inputs but also by the ability to generate output relative to those inputs. If additional capital increases SHU but the increase in capital inputs is relatively greater than the increase in output, then an increase in net income can occur without a corresponding increase in efficiency. Thus, the study's results show that the magnitude of financial performance and efficiency are two distinct dimensions.

The findings regarding productivity show a more consistent pattern. In the panel regression, productivity has a positive and significant relationship with SHU, whereas in the logistic regression, productivity has a coefficient of 0.120200 with a p-value of 0.0022 and an odds ratio of 1.128. Thus, an increase in productivity is associated with an increase in SHU as well as an increase in the odds that a cooperative is operating efficiently.

This consistency can be explained through production and efficiency theory, as productivity reflects the ability to generate output from the resources used. When a cooperative is able to increase its output relative to the resources utilized, this increase is reflected in both financial performance and efficiency. These findings are also consistent with the research by Nguyen et al. (2023) and Latha et

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al. (2025), which highlight the importance of productivity, technology, and digitalization in supporting cooperative performance. Although this study does not directly examine digitalization, the productivity results indicate that a cooperative's ability to increase output from available resources is a key factor in improving performance.

In contrast to these internal variables, SBDK exhibits a different pattern between financial performance and efficiency. In the panel regression, SBDK has a coefficient of -5,940.85 and a p-value of 0.0091, indicating that an increase in SBDK is associated with a decrease in SHU. This finding can be explained through the PESTEL framework, specifically the economic dimension, which identifies external economic conditions as factors that can influence organizational activities. Interest rates are related to financing costs and decisions regarding the use of funds; thus, changes in financing conditions can affect the financial performance of cooperatives.

These findings are consistent with Hiep et al. (2025), who demonstrated the importance of external and socioeconomic factors in explaining cooperative performance. However, when efficiency was used as the dependent variable, the SBDK model did not show a significant relationship. The logistic model yielded a positive coefficient of 0.019123, an odds ratio of 1.019, but a probability of 0.7429. Thus, this study found evidence that SBDK is associated with the amount of SHU, but did not find statistical evidence that SBDK is associated with the probability of a cooperative being on the efficiency frontier.

These differences in SBDK results further reinforce the finding that financial performance and efficiency cannot be treated as identical concepts. External factors can influence the magnitude of financial output, but they do not necessarily determine a cooperative's relative position on the efficiency frontier. This also explains why relying on a single indicator can provide an incomplete picture of a cooperative's condition.

These findings provide a more comprehensive answer to the research questions. The challenges facing cooperatives are not merely about how to increase financial output, but how to ensure that increased resources and business activities yield optimal output. DEA analysis indicates that cooperative efficiency still varies across provinces and over time. Panel regression then identifies factors associated with the magnitude of SHU, while logistic regression shows that factors related to SHU do not always have the same relationship with the probability of efficiency.

From the Structure-Conduct-Performance (SCP) perspective used in this study, the results indicate that resource characteristics and the economic environment may be related to cooperative management behavior, which is then reflected in performance. However, this relationship is not always linear. The amount of capital, for example, can increase capacity and SHU but does not necessarily lead to higher efficiency. Similarly, external economic conditions, as represented by the SBDK, are related to financial performance but do not show a significant relationship with the probability of efficiency. This suggests that management's ability to allocate and convert resources into output is a key factor in explaining the differences between financial performance and efficiency.

Thus, this study contributes by integrating three analytical perspectives into a single framework: efficiency measurement using DEA, analysis of the determinants of net income using panel data regression, and analysis of the probability of efficiency using binary logistic regression. This approach demonstrates that evaluating cooperative performance yields a more comprehensive understanding when it considers not only the amount of output produced but also how efficiently resources are used to generate that output. The study's findings also indicate that strategies to improve cooperative performance should not focus solely on increasing resources but must also prioritize productivity and the ability to efficiently convert resources into output.

4. CONCLUSION

Based on the results of a study on the efficiency and financial performance of cooperatives in Indonesia during the 2016–2023 period, it can be concluded that:

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1. Cooperative efficiency fluctuated across periods and provinces. The average DEA score reached 0.759 in 2019, then declined to 0.508 in 2022, and rose again to 0.751 in 2023. This indicates that cooperatives' ability to convert the number of members, capital, and business volume into net surplus has not been consistent.
2. The financial performance and efficiency of cooperatives are not entirely identical.The research results show that an increase in SHU is not always accompanied by an increase in efficiency. Thus, the magnitude of financial output must be considered alongside the cooperative's ability to optimize the resources it uses.
3. The number of members and productivity show a consistent relationship with cooperative performance. Both variables are positively correlated with SHU and are also positively correlated with the probability that a cooperative will achieve an efficient state. These findings highlight the importance of strengthening the membership base and increasing productivity in supporting both cooperative performance and efficiency.
4. Capital growth exhibits a different relationship pattern between financial performance and efficiency. Capital is positively correlated with SHU but negatively correlated with the probability of efficiency. This suggests that an increase in capital capacity does not necessarily lead to improved efficiency if additional inputs are not accompanied by a proportional increase in output.
5. SBDK exhibits different relationships across the two performance dimensions. SBDK is negatively correlated with SHU but shows no significant relationship with the probability of efficiency. This indicates that this external factor has distinct relationships with both the financial performance and efficiency of cooperatives
6. This study offers both academic and practical benefits. Academically, it presents an approach that integrates Data Envelopment Analysis (DEA), panel data regression, and logistic regression to simultaneously examine the efficiency and financial performance of cooperatives. Practically, the research findings can serve as supporting information for the government and cooperative managers in designing performance improvement strategies that are not only oriented toward capital increases and higher SHU but also toward strengthening membership, increasing productivity, and improving resource efficiency
7. The main implication of this study is the need for a balance between growth and efficiency. Enhancing a cooperative's capacity must be accompanied by the ability to convert resources into output more productively. Thus, a cooperative's success is not measured solely by the amount of SHU generated, but also by how efficiently those resources are utilized

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