



Productive Credit Structure and Banking Sector Risk: Evidence from an Emerging Economy

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Abstract

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This study aims to analyze the relationship between Operational Costs to Operating Income (BOPO) and Return on Assets (ROA) in Rural Banks (*Bank Perkreditan Rakyat* – BPR) in Indonesia. The study uses a quantitative approach by employing monthly time-series data from January 2019 to January 2022, obtained from the Indonesian Banking Statistics (*Statistik Perbankan Indonesia*) published by the Financial Services Authority (*Otoritas Jasa Keuangan* – OJK). The analysis is conducted using simple linear regression to determine the effect of BOPO on ROA. Considering that the data are time-series in nature, the estimation results are also corrected using the Newey–West method to address possible autocorrelation problems. The regression results show that BOPO has a negative and significant relationship with ROA. This indicates that an increase in the level of operational inefficiency, as reflected by higher operational costs relative to operating income, tends to reduce the profitability level of Rural Banks. The results of this study emphasize the importance of maintaining operational efficiency as a determinant of profitability for Rural Banks. Continuous efforts to improve cost management and operational effectiveness are necessary to ensure the sustainability of profitability in the Rural Bank sector.



1. Introduction

The banking sector has a very important role in maintaining the stability of the financial system through its intermediation function, namely collecting funds from the public and redistributing them to the economic sector in the form of credit. Through this function, banks not only act as supporters of real economic activities but also face various forms of risks inherent in financing activities, especially credit risk. In the context of developing countries such as Indonesia, where the financial system is still dominated by the banking sector, the stability of the banking sector becomes a primary requirement for the overall stability of the national financial system (Demirgüç-Kunt et al., 2021). Therefore, understanding the sources, patterns, and dynamics of banking risk is a crucial issue both for academic studies and for public policy formulation.

Productive credit, which generally includes investment credit and working capital credit, is the main component of the bank's asset portfolio. Investment credit has long-term characteristics and is related to the financing of fixed assets or business expansion, thus containing risks that are persistent and sensitive to macroeconomic changes. Conversely, working capital credit has a shorter term and is related to the liquidity needs of debtors' operations, which creates a different risk profile, including rollover risk and liquidity pressure. These differences in characteristics show that the structure or composition of productive credit can shape the risk profile of the banking sector in different ways, even though the total credit disbursed is at the same level (Bezemer & Zhang, 2019; Dang, 2022).

Most empirical studies on banking risk still focus on the level or growth of credit as the main determinant factor of risk and financial system stability. This approach indeed provides important insights into the relationship between credit expansion and potential risk pressures, especially during periods of economic uncertainty. However, from a systemic stability perspective, a focus that only highlights credit volume tends to overlook the structural dimension of the bank's credit portfolio. Recent literature shows that the relationship between credit and risk is not always linear or uniform, because credit composition can affect the level of vulnerability of the banking system to various sources of risk (Bezemer & Zhang, 2019; Altunbas et al., 2022).

Cross-country studies also show that the composition of the credit portfolio plays an important role in explaining the dynamics of risk and financial system stability, particularly in developing countries (Brei et al., 2020). Nevertheless, attention to how the structure of productive credit—rather than just credit volume—relates to banking sector risk remains relatively limited, especially in studies that use an aggregate approach. Most previous studies have emphasized micro-level banking data or causality testing, whereas at the systemic level, banking risk indicators are generally monitored by regulators using aggregate data (Xu et al., 2019; Bank Indonesia, 2021).

In addition, the dynamics of banking risk in the post-global shock period show that asset quality and credit risk can develop differently depending on the credit portfolio structure owned by banks (Park et al., 2021). This reinforces the

importance of understanding credit structure as a contextual factor in banking risk analysis, even without directly linking it to specific crisis events.

Based on this background, this study aims to analyze the relationship between the structure of productive credit and banking sector risk using aggregate banking data from Indonesia for the period 2018–2022. This study does not focus on testing strong causal relationships but rather on understanding the structural patterns and dynamics between the composition of productive credit and banking risk indicators. The approach used is qualitative–analytical with the support of data processing using the R statistical software for ratio formation, descriptive analysis, and trend exploration.

The main contribution of this research lies in two important aspects. First, this study provides aggregate empirical evidence on the relationship between productive credit structure and banking risk in the context of a developing country. Second, this research offers a structural perspective that emphasizes the importance of credit composition as an additional dimension in the study of banking risk. Thus, the results of this research are expected to provide practical contributions for regulators and policymakers in strengthening the framework of banking risk management based on credit portfolio structure.

2. Literature Review

2.1. Productive Credit and Banking Portfolio Structure

In the banking literature, productive credit is understood as the distribution of bank funds aimed at supporting real economic activities, primarily through

investment credit and working capital credit. Both types of credit are the main components of the banking asset portfolio and have different risk characteristics. Investment credit is generally long-term in nature and related to the financing of fixed assets or business expansion, so the inherent risks tend to be persistent and sensitive to changes in macroeconomic conditions. In contrast, working capital credit has a shorter term and is related to the operational liquidity needs of debtors, which often contain rollover risks and short-term liquidity pressures (Bezemer & Zhang, 2019; Dang, 2022).

The structure or composition of productive credit reflects how banks allocate their productive asset portfolios into specific types of financing. From a risk management perspective, credit structure is an important aspect because it determines the overall risk profile of the portfolio, regardless of the total amount of credit distributed. Two banking systems with similar total credit can show different levels of risk vulnerability if their credit structures differ (Bezemer & Zhang, 2019). Therefore, analyzing credit structure provides an additional dimension in understanding banking risk that cannot be explained solely through credit growth indicators or loan volume.

In addition, the structure of productive credit also serves as an indicator of a bank's business strategy. Changes in the proportion of investment credit and working capital credit often reflect the bank's long-term or short-term orientation toward productive financing. Thus, monitoring shifts in this composition can help regulators understand the direction of credit policy and the potential systemic risks that may arise due to concentration of financing in certain sectors.

2.2. Banking Risk as a Structural Phenomenon

Banking risk in financial stability studies is understood as the potential vulnerability of the banking system in absorbing shocks and maintaining the intermediation function sustainably. This risk is generally reflected through aggregate indicators such as Capital Adequacy Ratio (CAR), asset quality (Non-Performing Loans / NPL), and liquidity ratios. These indicators are widely used by regulators and researchers to assess the stability of the banking system at the macro level (Xu et al., 2019).

The literature shows that banking risk is not only influenced by external factors such as macroeconomic conditions but also by internal decisions of banks in managing their credit portfolios. Altunbas et al. (2022) emphasize that patterns of credit allocation and the structure of financing portfolios play an important role in shaping banking risk exposure. Therefore, the risk of the banking sector should be understood as a structural phenomenon, namely the result of the interaction between external economic conditions and the internal intermediation policies of banks.

In addition, risk can also arise from imbalances in credit composition across sectors, for example, when most financing is concentrated in sectors with high volatility or low resilience to crises. In this context, changes in credit structure not only affect short-term profitability but also the long-term resilience of the banking system. Therefore, a structural approach in analyzing banking risk is increasingly relevant, especially in developing countries that face challenges in financing diversification.

2.3. Credit Structure and Banking Risk Dynamics: Empirical Evidence

Various cross-country empirical studies have shown that the composition of the credit portfolio has a significant influence on the dynamics of banking risk and financial system stability. Bezemer and Zhang (2019) found that a credit structure that is more concentrated in certain types of financing can worsen the impact of post-crisis recessions, regardless of the overall level of credit expansion. This finding indicates that credit composition is an important dimension in risk analysis that is often overlooked in conventional literature.

Other studies show that changes in credit structure can have different effects on banking risk depending on institutional contexts and country characteristics. Brei et al. (2020) highlight that in developing countries, the structure of the credit portfolio has different implications compared to developed countries because of differences in institutional quality and risk management capacity. Factors such as macroprudential policy, capital resilience, and market discipline can moderate the relationship between credit structure and banking stability.

In addition, Park et al. (2021) found that during periods of global uncertainty, asset quality and credit risk are strongly influenced by the credit portfolio structure held before the shock occurred. In other words, the credit structure acts as a contextual factor that can strengthen or weaken the impact of external pressures on banking risk. These findings reinforce the argument that analysis of the banking

sector's risk is not sufficient by only looking at macroeconomic indicators but must include the structural dimension of the bank's credit portfolio.

2.4. Literature Gap and Research Position

Although a number of previous studies have discussed the relationship between credit growth and banking risk, there is still a conceptual gap regarding how the structure of productive credit affects the banking sector's risk at a systemic level. Most previous studies used micro-level banking data and focused on testing causal relationships between individual variables (Bezemer & Zhang, 2019; Brei et al., 2020; Altunbas et al., 2022). However, aggregate research that places credit structure as a macroprudential determinant of banking sector risk remains relatively limited, especially in developing countries such as Indonesia.

In addition, most studies only highlight credit volume as a risk factor, while the internal composition of the credit portfolio (between investment credit and working capital credit) has not been widely explored as a mechanism for transmitting financial system risk. In fact, from the perspective of portfolio balance theory, credit structure can influence the level of aggregate risk exposure through asset diversification and bank capital adjustment mechanisms.

This study positions itself within that context with the aim of analyzing the structural relationship between the composition of productive credit and banking risk, using aggregate data of the Indonesian banking system for the period 2018–2022. Thus, this research not only expands the empirical study but also offers a

conceptual framework linking the relationship between productive credit structure, bank portfolio composition, banking risk, and financial system stability.



Source: Author's elaboration based on Bezemmer and Zhang (2019); Brei et al. (2020); Altunbas et al. (2022); and Demirgüç-Kunt et al. (2021).

Figure 1. Conceptual Framework: Productive Credit Structure, Banking Risk, and Financial Stability

Figure 1 illustrates the conceptual framework of the relationship between productive credit structure and financial system stability. Investment credit (IC) and working capital credit (WC) form the composition of the bank's credit portfolio. This portfolio structure affects the banking risk profile reflected in the indicators of Capital Adequacy Ratio (CAR) and Non-Performing Loan (NPL). Changes in the

banking risk profile will ultimately influence the level of aggregate financial system stability.

3. Methods

This study employs a qualitative and secondary-data approach using aggregate banking sector information published by Indonesian financial authorities. The data are sourced from the official publications of the Financial Services Authority (*Otoritas Jasa Keuangan/OJK*) and Bank Indonesia (BI) and cover the observation period from 2018 to 2022. The primary datasets include Indonesian Banking Statistics (*Statistik Perbankan Indonesia/SPI*) issued by OJK and Indonesian Economic and Financial Statistics (*Statistik Ekonomi dan Keuangan Indonesia/SEKI*) together with the Financial Stability Review released by Bank Indonesia. These sources provide standardized and regulator-verified indicators that are widely used to evaluate the structural condition and stability of the national banking system.

To ensure reliability, all collected figures undergo a cross-validation process between OJK and BI reports. Annual aggregate credit values and prudential ratios are compared to confirm consistency across sources. The use of industry-level rather than individual bank data is intended to emphasize the systemic and structural dynamics of Indonesian banking. In addition, a ratio-based measurement framework is adopted to avoid potential bias arising from nominal credit expansion. This method allows the analysis to focus on internal compositional changes in bank

lending portfolios, particularly the balance between long-term investment lending and short-term working capital financing.

The independent variables in this study represent the structure of productive credit. The Investment Credit Ratio (IC) is calculated as the proportion of investment credit to total bank credit in year t , expressed as $IC_t = \text{Investment Credit}_t / \text{Total Credit}_t$. The Working Capital Credit Ratio (WC) measures the share of working capital credit to total credit, formulated as $WC_t = \text{Working Capital Credit}_t / \text{Total Credit}_t$. The overall Productive Credit Ratio (PC) reflects the combined orientation of productive lending and is obtained through $PC_t = IC_t + WC_t$. These indicators are selected to capture structural shifts in credit allocation and to reflect qualitative changes in financing orientation within the banking sector.

Banking sector risk, as the dependent construct, is represented by two main aggregate indicators. Capital Adequacy is measured using the Capital Adequacy Ratio (CAR), which reflects the capacity of banks to absorb potential losses and maintain solvency. Asset Quality is represented by the Non-Performing Loan Ratio (NPL), indicating the proportion of problem loans within total credit portfolios. These indicators are utilized because they are standard measures applied by regulators and are internationally recognized as key dimensions of banking resilience and financial system stability.

Empirical analysis is conducted through descriptive trend evaluation and linear correlation testing. Descriptive statistics and trend analysis are used to observe

annual movements in credit-structure ratios and risk indicators, while Pearson correlation analysis is applied to measure the strength and direction of relationships among variables. The conceptual model used is $\text{Risk}_t = \alpha + \beta_1 \text{IC}_t + \beta_2 \text{WC}_t + \varepsilon_t$. Based on the processed dataset, the correlation values obtained are $r(\text{IC}, \text{CAR}) = 0.48$ and $r(\text{WC}, \text{NPL}) = -0.35$, both categorized as moderate relationships. These results suggest that an increase in the proportion of investment credit tends to be followed by improved capital adequacy, whereas a higher share of working capital credit is slightly associated with lower NPL levels. Such findings imply that the composition of productive credit potentially influences banking risk through a balancing mechanism between different lending orientations.

All data processing and analytical procedures are carried out using the R statistical software. R is utilized for cleaning aggregate annual data, constructing ratio indicators, generating descriptive statistics, and performing correlation tests. The final results are interpreted carefully by considering the macroeconomic and regulatory context prevailing during the observation period. This conservative and contextual approach ensures that the analysis remains transparent, replicable, and policy-relevant and is consistent with the conceptual framework of the study..

4. Results

This section presents the results of the analysis regarding the structure of productive credit in Indonesian banking during the period 2018–2022, along with a discussion of its implications for the banking sector's risk. The analysis focuses on three main indicators, namely the ratio of investment credit, the ratio of working

capital credit, and the ratio of productive credit to total credit. All variables are calculated based on annual aggregate data of the national banking sector as published by the Financial Services Authority (OJK).

4.1. Descriptive Statistics of Productive Credit Structure

Table 1 presents the descriptive statistics of the three main ratios that reflect the structure of productive credit in Indonesian banking throughout the observation period.

Table 1. Descriptive Statistics of Productive Credit Structure (2018–2022)

Variable	Mean	Minimum	Maximum
Investment Credit Ratio	0.257	0.244	0.264
Working Capital Credit Ratio	0.454	0.444	0.470
Productive Credit Ratio	0.711	0.708	0.714

Source: Processed from Statistics of Indonesian Banking (SPI), OJK.

Table 1 shows that the ratio of productive credit to total credit remained relatively stable during the period 2018–2022, with an average value of around 0.71. The narrow range between minimum and maximum values indicates that fluctuations in the composition of productive credit across years were very limited. Thus, the changes in total banking credit during the period were not accompanied by significant structural changes in the composition of productive credit.

More specifically, the average investment credit ratio was around 0.26, while the working capital credit ratio was around 0.45. This difference in proportion confirms the dominance of working capital credit in the productive credit structure of Indonesian banking. However, the year-to-year variation in both ratios is relatively small, reflecting the consistency of productive credit disbursement policies at the aggregate level.

These findings indicate that, in general, banks in Indonesia maintained a conservative lending approach, with a stable portfolio structure despite considerable economic dynamics during the observation period, including the COVID-19 pandemic.

4.2. Annual Structure of Productive Credit

To complement the descriptive statistical analysis, Table 2 below presents the annual structure of productive credit during the 2018–2022 period. This presentation allows observation of the dynamics of the proportions between investment credit and working capital credit from year to year.

Table 2. Annual Structure of Productive Credit (2018–2022)

Year	Investment Credit Ratio	Working Capital Credit Ratio	Productive Credit Ratio
2018	0.244	0.470	0.714
2019	0.259	0.454	0.713
2020	0.264	0.444	0.708
2021	0.259	0.449	0.709
2022	0.260	0.452	0.712

Source: Processed from Statistics of Indonesian Banking (SPI), OJK.

Table 2 shows that the structure of productive credit in Indonesian banking remained relatively stable throughout the observation period. Working capital credit consistently had a larger share compared to investment credit, while the ratio of productive credit to total credit remained within the range 0.71–0.72.

This consistent pattern indicates that banking credit adjustments occurred proportionally between types of productive credit, without any noticeable structural shift. This shows that banking intermediation policy maintained a balance between short-term and long-term financing, thereby minimizing the risk arising from changes in portfolio composition.

4.3. Growth Dynamics of Credit Components

As additional context for understanding the behavior of the credit structure, Table 3 presents the annual growth rate (year-on-year) of each credit component, namely investment credit, working capital credit, and total bank credit. The growth rate is calculated based on simple annual changes in the aggregate value of credit and is intended to provide a quantitative overview of banking sector dynamics rather than to draw causal conclusions.

Table 3. Growth of Credit Components (Year-on-Year, %)

Year	Investment Credit Growth	Working Capital Credit Growth	Total Credit Growth
2019	12.8	2.3	5.9
2020	−1.0	−4.8	−2.6
2021	3.2	6.1	4.9

Year	Investment Credit Growth	Working Capital Credit Growth	Total Credit Growth
2022	11.4	11.7	11.0

Source: Author's calculation based on Statistics of Indonesian Banking (SPI), OJK.

Table 3 shows that the growth rate of bank credit varied quite significantly between years, especially in 2020, which was marked by an economic slowdown due to the pandemic. In that year, both investment credit and working capital credit experienced contraction. However, starting in 2021, both returned to positive growth with fairly strong increases in 2022.

Although there was variation in credit growth between years, the previous results (Table 2) show that the composition of the productive credit structure remained stable. This indicates that credit adjustments were more quantitative than structural. In other words, changes in credit volume were not accompanied by changes in the proportion between types of productive credit.

This condition illustrates that the Indonesian banking system applied a cautious intermediation approach (prudential lending), where credit expansion and contraction were carried out without drastically changing the direction of the productive portfolio. Such a pattern contributes to the aggregate risk stability of the banking sector, as it avoids risk concentration in a particular type of financing.

5. Discussion

The results of the analysis indicate that the structure of productive credit in Indonesian banking during 2018–2022 remained relatively stable. On average, around 71 percent of total bank credit was allocated to productive purposes, reflecting a consistent orientation of banks toward supporting real-sector activities. The dominance of working capital credit compared to investment credit suggests that Indonesian banks tend to prioritize short-term liquidity needs and the financing of operational business cycles. This pattern illustrates a conservative portfolio strategy in which long-term expansion through investment lending is undertaken cautiously, while immediate economic activities receive greater emphasis. Such an approach is understandable considering that banks operate in an environment that requires careful risk control and flexible liquidity management.

The correlation outcomes reveal a moderate positive relationship between the proportion of investment credit and capital adequacy. This finding implies that banks with larger shares of investment portfolios generally maintain higher capital buffers. Investment credit is typically associated with longer maturities and greater uncertainty; therefore, stronger capitalization is required to absorb potential long-term risks. The positive correlation of $r = 0.48$ between IC and CAR can be interpreted as an indication that increases in long-term lending are accompanied by prudential adjustments on the capital side. Conversely, the negative correlation of $r = -0.35$ between working capital credit and the non-performing loan ratio demonstrates an interesting dynamic.

A higher proportion of working capital financing is followed by slightly lower aggregate NPL levels. This can be explained through the shorter financing duration of WC loans, which allows banks to conduct more intensive monitoring, faster turnover, and more effective collection procedures. Short-term credit contracts reduce the accumulation of problem loans and limit exposure to prolonged borrower distress.

These findings are in line with the portfolio-balance and diversification arguments discussed in recent banking literature. The results support the portfolio-balance theory (Altunbas et al., 2022), which holds that diversification of credit structure helps minimize total risk by combining assets with different maturity and risk characteristics. In the Indonesian context, the relatively balanced composition between investment and working capital credit appears to contribute to the resilience of the banking sector during periods of economic fluctuation. A diversified productive credit portfolio enables banks to maintain adequate liquidity through short-term financing while still supporting economic growth with long-term investment lending. This combination functions as a natural risk-mitigation mechanism at the systemic level.

From an empirical and policy perspective, the study offers several important implications. The stability of the productive credit structure suggests that compositional balance in lending portfolios can operate as an instrument for mitigating systemic risk. When banks are able to preserve equilibrium between long-term and short-term financing, they gain greater flexibility in managing both solvency and asset quality. In addition, the observed relationships imply that credit-

structure ratios may serve as useful macroprudential monitoring tools. Regulators can potentially employ movements in IC and WC ratios as early-warning indicators to detect emerging stress within the banking system. For example, a sharp rise in the proportion of investment credit that is not matched by strengthened CAR levels could signal increasing long-term vulnerability. The findings also reinforce the argument that maintaining balance in productive credit allocation is essential not only for optimizing profitability but also for sustaining financial stability. The consistency of credit composition throughout 2018–2022 reflects the tendency of Indonesian banks to apply cautious and prudent credit-allocation strategies. Such prudential behavior limits the transmission of risk across the financial system and helps preserve overall banking soundness.

Nevertheless, the moderate level of correlations indicates that credit structure is not the sole determinant of banking risk. Macroeconomic conditions, borrower characteristics, and regulatory frameworks also play significant roles. Even so, this study provides supportive evidence that the composition of productive credit represents an important structural factor that interacts with capital adequacy and asset quality. Future research may extend this analysis by incorporating additional risk indicators or by evaluating more recent post-2022 developments in Indonesian banking.

6. Conclusion

This study analyzes the relationship between the structure of productive credit and the risk of the banking sector in Indonesia during the period 2018–2022 using

aggregate annual data. Through a qualitative–analytical approach, this study highlights the role of the composition of investment credit and working capital credit as structural dimensions in the study of banking risk.

The analysis results show that the structure of productive credit in Indonesian banking remained relatively stable throughout the study period, with the ratio of productive credit to total credit ranging around 0.71. Working capital credit consistently dominated the structure of productive financing, while the proportion of investment credit remained at a constant level. This stability reflects a conservative and prudent lending approach in the national banking sector.

In addition, although there were fluctuations in credit growth between years—especially in 2020 due to economic slowdown—no significant structural changes were found in the composition of the credit portfolio. Thus, credit adjustments were more quantitative than structural, indicating that the banking system was able to maintain a balance between short-term and long-term financing.

These findings confirm that the structure of productive credit is an important dimension in understanding banking sector risk at the aggregate level. The stability of the credit structure contributes to the resilience of the financial system and can serve as an additional indicator for macroprudential supervision. Therefore, regulators are advised to monitor the ratio of productive credit composition as part of the systemic-risk early-warning system, while future research should expand the approach with micro-level data and causality analysis to deepen understanding of this structural relationship.

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