



The Influence of Risk Aversion, Efficiency, Credit Risk, Diversification on Cost of Financial Intermediation in Lower-Middle-Income Economies around the World

Prem Bahadur Budhathoki¹ Padam Bahadur Lama^{2*}

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ABSTRACT

Previous empirical studies reveal inconsistent outcomes regarding the relationship between risk aversion, efficiency, credit risk, diversification, liquidity, industry-specific factors, macroeconomic variables, and the social cost of financial intermediation. This study investigates the impact of risk aversion, efficiency, credit risk, diversification, liquidity, industry-specific factors, and macroeconomic conditions on the cost of financial intermediation (CFI) in lower-middle-income countries (LMIC), using secondary data obtained from the World Bank (2023, 2025) for the years 2000 to 2021. This study deployed POLS, fixed-effect (FE), and random-effect (RE) estimators, and the best estimator was selected utilizing the Hauman and Breusch-Pagan LM tests. Our findings indicate that income diversification reduces CFI in LMIC. Inefficiency, credit risk, risk aversion, and liquidity contribute to an increase in CFI. Bank concentration, an industry-specific variable, also enhances CFI. Banking sector development (BSD) negatively impacts CFI. The macroeconomic variable inflation positively affects CFI, whereas GDP growth negatively impacts CFI. This study presents several policy implications derived from our findings, particularly concerning lower-middle-income countries (LMIC): (1) Policymakers should promote competition to enhance efficiency and diversification by reducing entry barriers and providing tax incentives and subsidized loans; (2) policymakers should encourage banks to expand their deposit bases by attracting a larger number of depositors and decreasing reliance on a small number of large deposits, which significantly reduces the need to maintain higher liquidity and equity capital; and (3) policymakers should implement monetary policies aimed at reducing the inflation rate, fostering economic growth, and supporting the development of the banking sector.

Keywords: Risk Premium, Net Interest Margin, Operating Efficiency, Capital Ratio, Profitability

JEL Classification: G21, G28

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¹ MPhil, Saraswati Multiple Campus, Tribhuvan University, Kathmandu Nepal, prem.budhathoki@mahmc.tu.edu.np

^{2*} Corresponding author: MPhil, Tribhuvan University, Saraswati Multiple Campus, Kathmandu, Nepal, padam.lama@smc.tu.edu.np

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1. INTRODUCTION

The cost of financial intermediation (CFI) is an indicator for evaluating banks' performance and financial stability (Davis et al., 2025). Nonetheless, it constitutes a funding cost for borrowers, and an escalation in CFI may elevate loan defaults by diminishing borrowers' debt servicing ability, reducing banks' profitability, and heightening financial instability. Furthermore, CFI indicates higher credit risk, inefficiency, risk aversion, and low competition in the banking industry, which impose higher intermediation costs to society and hamper the well-being of individuals and the nation's economic prosperity (Hussain, 2013). As a risk-averse financial intermediary, a bank's CFI is affected by various risks such as interest rate, credit risk, market risk, operational risk, and liquidity risk (Alzoubi & Salem, 2022), and a widened risk premium for additional risk. The dealership model proposed by Ho and Saunders (1981) identified these major factors: risk aversion, competition, transaction size, interest rate volatility, default risk premium, and opportunity cost for required reserve. However, most of the current study included diversification as a significant factor affecting a bank's CFI.

Moving from interest-generating activities to fee and commission-generating activities (for instance, income from consultancy services, leasing, insurance, underwriting, and off-balance activities) reduces the dependency on a single source of income (Budhathoki et al., 2025). In addition, income derived from modern fee-based services compensates for the loss of net interest income by charging a lower interest margin (Kannan et al., 2001; Alzoubi & Salem, 2022). A higher level of CIF signals that operating inefficiency prevails in the banking system (Agoraki et al., 2019), and the impact of operating inefficiency on CFI is ambiguous. On the one hand, operating inefficiency can positively affect CFI because banks can charge high interest margins to compensate for their higher operating expenses from their customers (Bougatef & Korbi, 2018; Kebede, 2025). On the other hand, the inefficient bank cannot attract more deposits at lower interest rates due to high risk. The rising deposit rates relative to the lending rate may decrease the interest margin.

Furthermore, credit risk positively or negatively affects CFI. , banks can compensate for loan defaults by charging interest margins to their borrowers. However, it is argued that the bank with a higher default rate cannot impose a higher interest margin because depositors charge high interest rates for riskier banks and cannot increase lending rates relative to deposit rates. The empirical studies also show conflicting outcomes, from positive to negative.

The impact of risk aversion on CFI is ambiguous. The risk aversion, on the one hand, can increase banks' CFI. Though higher-level capital increases financial soundness and the risk tolerance capability of banks, it further accelerates banks' cost of funds (Bougatef & Korbi, 2018), and banks compensate these costs by charging higher interest rates from borrowers (Cruz-Garcia & Fernandez de Guevara, 2019). On the other hand, a higher level of equity signals lower risk to depositors, and shareholders are reluctant to take more risk (Cruz-Garcia & Fernandez de Guevara, 2019) and can obtain deposits at lower rates; as a result, a higher level of equity reduces the CFI. The BSD fosters competition within the financial system and reduces cartels and collusive behavior of banks, which can charge higher loan prices and impose higher CFI on society (Hussain, 2013). Conversely, lower competition brings inefficiency and increases the CFI (Alzoubi & Salem, 2022; Budhathoki et al., 2024).

The macroeconomic variable, inflation, can increase CIF because banks' real rate return would decline in the inflationary environment, and this loss can be compensated by charging higher interest margins to borrowers. Favorable economic growth can reduce CFI because a high level of economic growth positively influences the income level of people, and it reduces banks' nonperforming loans. It can get deposits at the lower interest rates.

Hence, using a sample of 25 LMICs worldwide, this study tested whether risk aversion and market structure affect CFI in LMICs, and its results are similar to the dealership model developed by Ho and Saunders in 1981. However, this study excluded some factors, such as transaction size and interest rate volatility, which were included in the dealership model. Moreover, this study extends some influential factors, such as diversification, efficiency, credit risk, BSD, and macroeconomic variables (for instance, inflation and GDP growth), that can affect CFI in LMIC. This study reinforces the theoretical foundation established by Ho and Saunders (1981) and provides policy implications for sustaining lower CFI, which promotes economic prosperity and financial stability in LMICs.

The remaining sections are structured as follows: Section 2 reviews both theory and empirical studies. Section 3 describes the method used in the study, and Section 4 summarizes the study's results. Section 5 presents a discussion of possible explanations for these relationships. Section 6 theorizes the results based on empirical findings.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

This section presents a review of both theoretical and empirical studies.

2.1.Theoretical review

The CFI is frequently examined by using the theoretical model of Ho and Saunders (1981), namely the dealership model. This model was frequently prolonged by Allen (1981) and Angbazo (1997). According to Ho and Saunders (1981), as a risk-averse dealer, a bank channels funds from depositors to borrowers in an uncertain financial environment, where demand for loans and supply of deposits are unpredictable. In addition, cash inflows and outflows arise from deposits, and loans are not always synchronized. Hence, banks must charge extra interest to cover the risk of unpredictable cash flows and profits. It ensures banks manage risks and continue to operate smoothly. Ho and Saunders (1981) divide the whole determinants into two parts: (1) pure margin, which consists of risk aversion, market structure (competition), size of transaction, and interest rate volatility, and (2) other factors, which include risk aversion, market structure (competition), size of transaction, and interest rate volatility. In their study, they presented the following function and regression model.

$$NIM = f(PS, IIR, OCRR, DRP, U)$$

$$NIM_i = \lambda_0 + \lambda_1 IIR_i + \lambda_2 OCRR_i + \lambda_3 DRP_i + U_i$$

Where NIM denotes net interest margin, PS denotes pure spread, consisting of risk aversion, market structure (competition), transaction size, and interest rate volatility. IIR denotes implicit interest rates. OCRR denotes opportunity cost for required reserve. DRP represents the default risk premium, and U represents the error term.

Later on, Poghosyan (2013) tested this model by using "bank-specific, macroeconomic, institutional, and regulatory determinants" (p.97). Similarly, Gyeke-Dako et al. (2018) also tested the dealership model. They explored the determinants of NIM (or CFI), which include diversification, size, competition, credit shock, profitability, liquidity, inflation, GDP growth, institutional quality, and financial development. The most recent study by Addai et al. (2023) tested this dealership model by including explanatory variables such as bank concentration, credit risk, liquidity, risk aversion, size, efficiency, quality of management, implicit interest payment, and others.

2.2. Empirical review

This sub-section presents a review of bank-specific, industry-specific, and macroeconomic variables that affect CFI.

2.2.1. Bank-specific factors

Diversification and CFI: Diversification can positively or negatively affect CFI. Previous empirical studies also revealed conflicting outcomes. For example, Karikari et al. (2023) analyzed the determinants of CFI in 29 African nations from 2006 to 2013. Using the system GMM, the study found that diversification adversely affects CFI. This result is backed by the arguments that moving from interest-based businesses to modern fees and commission-based income compensates for the lower NIM and still can hold the same overall profitability in the competitive world. Afrin et al. (2022) investigated the factors of CFI using the sample period 2015-2020 in Bangladesh. Using a fixed-effect (FE) model, the uncovered result showed that diversification adversely affects CFI. Similarly, the study of Rahman et al. (2018) found that diversification adversely affects CFI. Conversely, Rahman et al. (2023) explored the factors of CFI using a sample of emerging nations, using the sample period 2000-2003. Using a FE estimator, diversification positively affects CFI. However, the most recent empirical findings showed an adverse impact of diversification on CIF. Hence, this study put forward the first research hypothesis based on the empirical findings.

H_{1a}: Diversification reduces the CIF.

Efficiency and CFI: Previous empirical studies showed mixed conclusions about the nexus between efficiency and CFI. For instance, Gounder and Sharma (2012) researched the factors that affect CFI using a banks of Fiji from 2000 to 2010. Using PLS, fixed- and random-effect models, findings revealed that operating cost positively impacts CFI. Islam and Nishiyama (2015) analyzed the contributors of CFI using a sample of four South Asian nations covering 1997-2012. Using a FE estimator, the outcome demonstrated that operating costs favorably affect CFI. Afrin et al. (2022) investigated the factors of CFI using the sample period 2015-2020 in Bangladesh. Using a FE estimator, the outcome demonstrated that overhead cost to total assets directly affects the CFI. It indicated that inefficient banks impose higher NIM on their valuable customers to recover the higher overhead costs. Rahman et al. (2023) surveyed the factors of CFI using a sample of emerging nations for the period 2000-2003. Using a FE estimator, the outcome disclosed that the cost-to-income ratio negatively affects CFI. However, the operating cost ratio favorably affects CFI. Conversely, Karikari et al. (2023) analyzed the factors of CFI in 29 African nations from 2006 to 2013. Employing the system GMM, the findings revealed that inefficiency reduces the CFI. They argued that inefficient banks cannot charge higher interest rates to their customers. This study offers the second research hypothesis based on the more recent empirical findings.

H_{1b}: Inefficiency increases the CFI.

Credit risk and CFI: Previous empirical studies showed mixed conclusions about the nexus between credit risk and CFI. For instance, Gounder and Sharma (2012) investigated the determinants that affect CFI adopting banks of Fiji from 2000 to 2010. Applying PLS, FE, and random-effect (RE) estimators, the outcome showed that credit risk positively impacts CFI. Rahman et al. (2023) had analyzed the factors of CFI utilizing a sample of emerging nations for the period 2000-2003. Utilizing a FE estimator, the outcome unveiled that credit risk has negligible influence on CFI. Afrin et al. (2022) investigated the factors of CFI for the period 2015-2020 in Bangladesh. Utilizing a FE model, the result disclosed that credit risk adversely affects CFI. This study introduces the third research hypothesis based on the more recent empirical findings.

H_{1c}: Credit risk increases the CFI.

Risk aversion and CFI: Previous empirical studies showed mixed conclusions about the nexus between risk aversion and CFI. Islam and Nishiyama (2015) analyzed the major factors of CFI using a sample of four South Asian nations covering 1997-2012. Applying a FE model, the result showed that the equity-to-assets ratio positively affects CFI. Afrin et al. (2022) investigated the factors of CFI covering the period from 2015 to 2020 in Bangladesh. Deploying a FE model, the result uncovered that the CAR favorably affects CFI, indicating that holding a higher level of equity poses a higher cost to the banks, and banks pass their higher cost to the customers. Similarly, Rahman et al. (2018) also found that the equity-to-assets ratio and CAR positively affect CFI. Rahman et al. (2023) delved into the factors of CFI utilizing a sample of emerging countries for the period 2000-2003. Using a FE model, the result demonstrated that the capital ratio positively affects CFI. This study presents the fourth research hypothesis based on the more recent empirical findings.

H_{1d}: Risk aversion increases the CFI.

Liquidity and CFI: Previous empirical studies showed that liquidity increases CFI. For instance, Gounder and Sharma (2012) studied the factors that affect CFI utilizing a sample of banks in Fiji for 2000-2010. Adopting PLS, FE, and RE models, the outcome depicted that liquidity has an insignificant adverse impact on CFI. Islam and Nishiyama (2015) studied the determinants of CFI employing a sample of four South Asian nations for the period 1997-2012. Using a FE model, the outcome demonstrated that liquidity increases the CFI. Gyeke-Dako et al. (2018) examined the impact of financial development on CFI using a sample of 29 African nations for the period 2006-2013. Using RE and GMM models, the results showed that liquidity increases the CFI. Karikari et al. (2023) examined the variables that affect CFI in 29 African nations for 2006-2013. Applying the system GMM, the result demonstrated that liquidity increases the CFI. This study presents the fifth research hypothesis based on the more recent empirical findings.

H_{1e}: Liquidity increases the CFI.

2.2.2. Industry-specific factors

BSD and CFI: Previous empirical studies showed that BSD increases CFI. Gyeke-Dako et al. (2018) analyzed the impact of financial development on CFI utilizing a sample of 29 African nations for the period 2006-2013. Using RE and GMM estimators, they found that

developed financial systems reduce CFI. They supported this finding by arguing that banks are more efficient, run at lower costs, and earn the same volume of net interest income and NIM by charging lower interest margins in developed financial systems. Similarly, Das Gupta et al. (2021) examined the link between CFI, risk, and efficiency employing a sample of 32 banks in Bangladesh for the period 2000-2016. Applying the GMM, the outcome depicted that BSD negatively affects the CFI. Mia (2023) investigated the nexus between competition, capital, and CFI using the sample of 32 Bangladesh banks for 2011-2020. Using the Prais Panel-Westin estimator, the findings revealed that BSD inversely affects the CFI. This study presents the sixth research hypothesis based on the more recent empirical findings.

H_{2a}: BSD decreases the CIF.

Bank concentration and CFI: Previous empirical studies showed that bank concentration increases CFI. Gounder and Sharma (2012) researched the factors that affect CFI utilizing a sample of banks in Fiji from 2000 to 2010. Using PLS, FE, and RE models, the results demonstrated that bank concentration positively impacts CFI. Rahman et al. (2018) also studied the impact of capital on CFI utilizing 22 banks of Bangladesh from 2000 to 2014. It also investigated the influence of bank concentration on CFI. Using the GMM, the findings showed that bank concentration increased the CFI. Gyeke-Dako et al. (2018) delved into the impact of financial development on CFI, utilizing a sample of 29 African countries for the period 2006-2013 and applying RE and GMM models. The outcome showed that bank concentration positively affects CFI. Karikari et al. (2023) studied the factors of CFI in 29 African nations from 2006 to 2013. Utilizing the system GMM, the result disclosed that bank concentration positively affects the CF due to monopolistic behavior. Khattak et al. (2023) surveyed the nexus between market power and CFI using a sample of 14 dual-banking countries from 2005 to 2018. Deploying the quantile estimator, the findings revealed that a high market power increases the CFI. Rahman et al. (2018) found that GDP growth did not affect CFI. Mia (2023) also found that bank concentration positively affects CFI, and competition negatively affects CFI. This study presents the seventh research hypothesis based on the more recent empirical findings.

H_{2b}: Bank concentration increases the CIF.

2.2.3. Macroeconomic and CFI

Inflation: The macroeconomic variable—inflation—has either a positive or negative effect on CFI, which is also supported by earlier empirical evidence. On the one hand, an increase in inflation affects both lending and deposit rates, and banks can control operating costs; it does not affect CFI. On the other hand, the inflation rate can increase banks' loan default, and these losses can be offset by higher interest margins to the borrowers. Empirical evidence also draws the same conclusion. For instance, Karikari et al. (2023) analyzed the determinants of CFI in 29 African nations from 2006 to 2013. Utilizing the system GMM, the findings revealed that inflation boosts CFI. This finding supports the argument that inflation can increase banks' loan default and is compensated for by charging higher interest rates to borrowers. Similarly, Mia (2023) also found that GDP and inflation favorably affect CFI. However, Tan (2016) and Das Gupta et al. (2021) found that inflation decreases the CFI. Anticipated inflation can be adequately managed by reducing costs. If the reduced cost exceeds the increased interest revenue, the banks can charge lower interest margins and still hold the same profitability.

GDP: Another macroeconomic variable—GDP growth—has increased or decreased CFI. For instance, Karikari et al. (2023) analyzed the determinants of CFI in 29 African nations from 2006 to 2013. Utilizing the quantile and system GMM, the findings revealed that economic growth increases CFI. Similarly, Mia (2023) also found that GDP stimulates CFI. Similarly, the study of Das Gupta et al. (2021) and Rahman (2023) found that GDP positively affects CFI. Conversely, Gyeke-Dako et al. (2018) investigated the impact of financial development on CFI utilizing a sample of 29 African countries for the period 2006-2013 and deploying RE and GMM estimators, finding that GDP has a direct but insignificant impact on CFI. The negative impact of GDP growth on CIF is supported by the arguments that a better economic environment attracts more competitors and reduces the CFI. This study presents the eighth research hypothesis based on the more recent empirical findings.

H_{3a}: Inflation increases the CIF.

H_{3b}: GDP growth decreases the CIF.

3. METHOD

This study employed an explanatory research design to fulfill the research objectives. This study sourced secondary panel data from the World Bank (2023) and World Bank (2025). Panel data incorporates time and firms' differences and offers more accurate results by controlling omitted variable biases (Karikari et al., 2023). This study has chosen 25 LMICs worldwide based on the availability of data, specifically data related to bank-specific variables, which the World Bank published as the title "World Financial Development Indicators" from 2000 to 2021. This study excluded HIC and UMIC because these countries have well-developed capital markets. In addition, this study excluded lower-income countries due to a lack of data availability, specifically bank-specific variables. Hence, this study focused on LMIC, where the equity market is not well-developed, and firms' financing mostly depends upon bank financing. The list of sample countries and periods is presented in Table 1.

Table 1. Sample countries and periods

Sample LMIC	Period
Bangladesh, Bolivia, Cameroon, Algeria, Egypt, Ghana, Honduras, Indonesia, India, Kenya, Kyrgyz Republic, Lesotho, Morocco, Nigeria, Nepal, Pakistan, Philippines, Senegal, Eswatini, Tajikistan, Tunisia, Tanzania, Ukraine, Uzbekistan, Vietnam (25 countries).	2000-2021

The variable selection, their measurements, sources, and expected sign/s are presented in Table 2.

Table 2. Variables selection

Variables	Measurements	Sources	Sign/s
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Cost of intermediation	$\frac{\text{Net interest income}}{\text{Total earning assets}}$	World Bank (2023)	
Diversification	$\frac{\text{Noninterest income}}{\text{Total income}}$	World Bank (2023)	[-]
Efficiency1	$\frac{\text{Overhead costs}}{\text{Total assets}}$	World Bank (2023)	[+]
Efficiency2	$\frac{\text{Costs}}{\text{Income}}$	World Bank (2023)	[+]
Credit risk1	$\frac{\text{Provision for loan losses}}{\text{Nonperforming loans}}$	World Bank (2023)	[+]
Credit risk1	$\frac{\text{Nonperforming loans}}{\text{Gross loans}}$	World Bank (2023)	[+]
Liquidity	$\frac{\text{Liquid assets}}{\text{Bank deposits}}$	World Bank (2023)	[+]
Risk aversion1	$\frac{\text{Bank capital}}{\text{Total assets}}$	World Bank (2023)	[+]
Risk aversion2	$\frac{\text{Regulatory capital}}{\text{Total risk weighted assets}}$	World Bank (2023)	[+]
BSD	$\frac{\text{Bank deposits}}{\text{GDP}}$	World Bank (2023)	[-]
Bank concentration	$\frac{\text{Sum of largest three banks' assets}}{\text{Total assets of all the banks}}$	World Bank (2023)	[+]
GDP growth	Annual GDP growth rates	World Bank (2025)	[-]
Inflation	Inflation rates based on CIP	World Bank (2025)	[+/-]

This study used net interest margin (NIM) as a proxy of the cost of financial intermediation (CFI), which is computed as the difference between total interest income and interest expenses divided by total earning assets. This indicator was previously used in the study of Poghosyan (2013), Calice and Zhou (2018), Afrin et al. (2022), and Khattak et al. (2023) to measure the CFI. This study used diversification as a first predictor variable, which is measured as non-interest income divided by total income. This indicator was previously used in the study of Calice and Zhou (2018), Afrin et al. (2022), and Khattak et al. (2023) to measure income diversification. We expect a negative association between diversification and CFI because diversified banks can earn the same profit by charging lower deposit rates or offering higher deposit rates (Bougatef & Korbi, 2018). Similarly, we used two proxies to measure efficiency: (1) efficiency1 is computed as overhead cost divided by total assets, and this proxy was used in the earlier study of Calice and Zhou (2018) and Afrin et al. (2022) and (2) efficiency2 is measured as cost divided by total income, which is used to check the robustness of the findings. We expect a positive association between the inefficiency ratio and CFI because inefficient banks charge higher interest margins to recover the higher operating expenses.

Furthermore, we used two proxies to measure credit risk: (1) credit risk1, which is computed as provision for loan losses divided by NPL, which is used in the earlier study of Calice and Zhou (2018) and Afrin et al. (2022), and (2) credit risk2, which is measured as NPL divided by gross loans. We expect credit risk (loan default) to increase CFI because banks earn the same profit level by charging higher interest margins to angel borrowers. Liquidity is

another predictor variable computed as liquidity divided by bank deposits; this proxy was used in Poghosyan's earlier study (2013). We expect liquidity proxy increases the CFI because holding more liquidity offers banks negligible income and can compensate by charging higher interest margins to borrowers. Similarly, this study used two proxies to measure risk aversion: (1) risk aversion1, which is computed as bank capital divided by total assets, and this proxy was used in the earlier study of Calice and Zhou (2018) and Khattak et al. (2023), and (2) risk aversion2, which is computed as the sum of core and supplemental capital divided by total risk-weighted assets and this proxy was used in the previous study of Afrin et al. (2022). We expect that holding more equity capital increases banks' cost of funds, and this cost can be compensated by charging higher interest margins from borrowers.

This study also deployed some industry-specific and macroeconomic variables as predictor variables. We employed the banking sector development (BSD) as a predictor variable, which is computed as bank deposits divided by GDP, and this proxy was used in the earlier study of Gupta et al. (2021) and Mia (2023). Similarly, we used the bank concentration ratio (BCR3) as another predictor variable, which is computed as the sum of the largest three banks' assets divided by the total assets of all banks, and this proxy was used in the earlier study of Rahman (2018). We expect bank BCR3 and BSD to negatively affect the CFI because they bring efficiency and reduce the CFIU. Similarly, we used the inflation rate, and this proxy was used in the earlier study of Poghosyan (2013), Calice and Zhou (2018), Afrin et al. (2022) and Khattak et al. (2023) and GDP growth rate as final predictor variables, and this proxy was used in the earlier study of Poghosyan (2013), Rahman (2018), and Khattak et al. (2023). We expect that inflation will increase CFI, and economic growth will decrease CFI.

This study investigated the impact of spread, diversification, efficiency, credit risk, liquidity, risk aversion, and macroeconomic conditions on the cost of intermediation (CFI) over the lower-middle-income nations worldwide. Hence, we express the following function to achieve the study's objective.

$CFI = f(\text{spread, diversification, efficiency, credit risk, liquidity, risk aversion, macro})$

We deployed baseline regression models based on the Hauman and Breusch-Pagan LM tests. First, we select the best model/s, either FE or RE, based on the Hauman tests. Second, we performed the Breusch-Pagan LM tests to select the PLOS or RE model. Finally, we choose the best models from PLOS, FE, and RE models, and the other two models are used to check the robustness of the findings. This study deployed the following PLOS estimator.

$$CFI_{it} = \beta_1 + \beta_2 \text{Diversification}_{it} + \beta_3 \text{Efficiency}_{it} + \beta_4 \text{Credit risk}_{it} + \beta_5 \text{Liquidity}_{it} + \beta_6 \text{Risk aversion}_{it} + \beta_7 \text{BCR3}_{it} + \beta_8 \text{Macro}_{it} + u_{it} \dots\dots\dots (1)$$

This study deployed the following fixed-effect estimator.

$$CFI_{it} = \beta_{1i} + \beta_2 \text{Diversification}_{it} + \beta_3 \text{Efficiency}_{it} + \beta_4 \text{Credit risk}_{it} + \beta_5 \text{Liquidity}_{it} + \beta_6 \text{Risk aversion}_{it} + \beta_7 \text{BCR3}_{it} + \beta_8 \text{Macro}_{it} + u_{it} \dots\dots\dots (2)$$

Also, this study deployed the following random-effect estimator.

$$CFI_{it} = \beta_1 + \beta_2 \text{Diversification}_{it} + \beta_3 \text{Efficiency}_{it} + \beta_4 \text{Credit risk}_{it} + \beta_5 \text{Liquidity}_{it} + \beta_6 \text{Risk aversion}_{it} + \beta_7 \text{BCR3}_{it} + \beta_8 \text{Macro}_{it} + \varepsilon_i + u_{it} \dots\dots\dots (3)$$

$i = 1, 2, 3, \dots\dots\dots, 25.$

$t = 1, 2, 3, \dots\dots\dots, 22.$

where CFI denotes the cost of intermediation. BCR3 denotes the three-bank concentration ratio. β_1 denotes the constant term. $\beta_2, \beta_3, \dots, \beta_8$ are the regression coefficients. u_{it} denotes error term. ε_i denotes intercept values of each country.

4. RESULTS

The summary statistics of response and predictor variables are presented in Table 3. The mean of CIF, which NIM measures, is 5.413 percent, and the SD is 2.520. The spread between max and min is 14.19 percent. Similarly, the average value of ID is 36.073, and its SD is 11.636. The spread between max and min is 70.668. The average score of the efficiency measure—OCTA—is 4.034, and its SD is 2.130. The average of another efficiency measure—CTI—is 55.118, and its SD is 14.157. Notably, the spread of CTI is higher than that of OCTA. The averages of credit risk1 and credit risk2 are 10.495 and 66.905, respectively. The results showed that the spread of credit risk2 is higher than credit risk1. It indicates that banks face higher levels of credit risk in LMIC; ultimately, this credit risk increases the social cost of borrowing a high-interest margin. The means of CTA and CAR are 10.527 and 16.109, respectively. The spread between these variables is comparatively lower. Similarly, the average of BCR3 and BDR is 58.754 and 36.608, respectively. Finally, the means of macroeconomic variables—GDP growth and inflation—are 4.488 and 6.825, respectively.

Table 3. Summary statistics

Variables	Mean	SD	Min	Max
Cost of intermediation (CFI)	5.413	2.520	1.253	15.441
Income diversification (ID)	36.073	11.637	14.407	85.075
Overhead to total assets (OCTA)	4.034	2.130	0.833	12.531
Cost-to-income (CTI)	55.118	14.157	26.121	202.041
Credit risk 1 (NPL/loans)	10.495	8.469	0.709	54.541
Credit risk 2 (provision/NPL)	66.905	35.065	2.000	269.1
Capital-to-assets (CTA)	10.527	3.660	1.490	24.400
Capital adequacy (CAR)	16.109	4.860	1.754	33.800
Liquidity1 (liquidity/deposits)	31.881	17.025	6.706	102.762
Bank concentration (BCR3)	58.754	20.791	16.144	100
Bank deposit to GDP (BDR)	36.608	21.125	3.231	109.477
GDP growth	4.488	3.153	-15.136	15.329
Inflation	6.825	5.962	-16.860	48.699

Note: SD denotes standard deviation. Min and max denote minimum and maximum value, respectively.

Table 4 presents the outcome of Pearson's correlation analysis and VIF. Primarily, this analysis is performed to check multicollinearity issues for further econometric analysis. If the correlation coefficients are more than 0.8 (Field, 2024) and the VIF is more than 5 (Kunter et al., 2005), we do not include both predictor variables in the same regression model. Furthermore, the correlation between predictor and response variables indicated the possible impact of predictor variables on response variables. The study's findings revealed that all the correlation coefficients and VIF are lower than 0.8 and 5, respectively, suggesting no multicollinearity issues between predictor variables. The inverse association between diversification and NIM ($r = -0.064$) indicates that a higher level of diversification offers lower

social borrowing costs to the borrowers. Conversely, two efficiency indicators—OCTA and CTI—are positively associated with NIM, suggesting that inefficient banks charge higher interest charges to borrowers and hinder economic prosperity. Similarly, two proxies of credit risk—Crisk1 and Crisk2—are positively linked with NIM, suggesting that the banks with more default loans charge a high interest margin to their customer and erode the debt service capacity of borrowers.

Furthermore, two proxies—CTA and CAR—are directly associated with NIM, indicating that holding a higher cost of capital increases bank funding costs and is compensated by changing to higher interest margins to borrowers. Similarly, liquidity is positively correlated with NIM, suggesting that holding higher liquidity does not earn income for banks and is compensated by charging high-interest margins to borrowers. Conversely, BSD negatively correlates with NIM, suggesting that BSD increases competition and efficiency, and banks can earn the same profit by charging lower interest margins. Turning into the macroeconomic variables, GDP growth, and inflation are positively linked with NIM, suggesting that higher economic growth demands more funds, and higher inflation reduces the real rate of returns, which increases banks' interest margin.

Table 5 presents the outcomes of regression analysis. We used the FE model as a baseline model. The baseline regression result showed that income diversification (ID) adversely affects CFI. We also used POLS and RE models to check the robustness of the findings. Notably, all eleven regression models draw the same conclusion regarding the impact of ID on CFI. Conversely, the two efficiency measures—OCTA and CTI—positively affect CFI; all nine regression coefficients of OCTA are statistically significant, and two coefficients of CTI are significant out of three coefficients, suggesting that inefficient banks charge higher interest margins to their borrowers, which can reduce their debt service capacity and increase default loans. Similarly, two credit risk measures—Crisk1 and Crisk2 positively affect CFI in LMIC. However, Crisk1 is significant in two regression models out of six models. Similarly, Crisk2 is significant only in two regression models out of six models. These outcomes suggest that a higher level of credit risk reduces the bank's profit, which is compensated for by charging a high interest margin to get the same profit level as banks. Similarly, two risk aversion measures—CTA and CAR— positively affect CFI in LMIC. It indicated that higher bank capital boosts banks' cost of funds and lowers profitability. However, it reduces banks' risk and is fulfilled by imposing high-interest margins on borrowers. Similarly, liquidity favorably affects CFI, suggesting that holding larger liquidity reduces both risk and returns, and these low returns are fulfilled by charging high-interest margins to borrowers, which can reduce the debt service capacity of borrowers. Similarly, BCR3 positively affects CFI in LMIC, suggesting that banks can charge a higher interest margin due to having more market power. Banks become more efficient and charge low interest margins in competitive banking. The first macroeconomic variable—GDP growth—negatively affects CFI, suggesting that high economic growth demands more funds and a rise in interest margin. Finally, the inflation rate positively affects CFI, indicating that in an inflationary environment, banks' real return would decline and is compensated by charging higher interest margins to borrowers.

Table 4. Correlation analysis

Variables	CIF	OCTA	CTI	Crisk1	Crisk2	CTA	CAR	Liquidity	BCR3	BSD	GDP	Inflation
CIF	1											
ID	-0.064 (0.145)											
OCTA	0.780** (0.000)	1										
CTI	0.151** (0.000)	0.587** (0.000)	1									
Crisk1	0.002 (0.966)	0.086 (0.097)	0.079 (0.127)	1								
Crisk2	0.032 (0.548)	0.064 (0.225)	0.159** (0.002)	- 0.103* (0.048)	1							
CTA	0.620** (0.000)	0.548** (0.000)	0.101 (0.053)	- 0.13** (0.000)		1						
CAR	0.455** (0.000)	0.366** (0.000)	-0.043 (0.409)	- 0.14** (0.005)	-0.15** (0.004)	0.788** (0.000)	1					
Liquidity	0.263** (0.000)	0.227** (0.000)	-0.856 (0.052)	0.069 (0.181)	-0.086 (0.104)	0.288** (0.000)	0.383** (0.000)	1				
BCR3	0.119** (0.000)	0.262** (0.000)	0.173** (0.000)	0.050 (0.330)	-0.056 (0.286)	0.306** (0.000)	0.277** (0.000)	0.440** (0.000)	1			
BSD	-0.48** (0.000)	-0.53** (0.000)	-0.24** (0.000)	-0.097 (0.058)	0.146** (0.000)	-0.44** (0.000)	-0.34** (0.000)	-0.36** (0.000)	-0.31** (0.000)	1		
GDP	0.052 (0.241)	0.065 (0.141)	0.038 (0.384)	- 0.101* (0.047)	-0.089* (0.085)	0.009 (0.866)	-0.029 (0.575)	0.023 (0.602)	-0.064 (0.145)	-0.17** (0.000)	1	
Inflation	0.214** (0.000)	0.211** (0.000)	0.079 (0.076)	0.097* (0.058)	-0.060 (0.252)	0.208** (0.000)	0.117* (0.022)	0.110* (0.014)	-0.041 (0.355)	-0.21** (0.000)	0.043 (0.323)	1
VIF		3.05	2.08	1.32	1.35	4.62	3.49	1.67	1.75	2.08	1.15	1.19

Note: CIF denotes the cost of financial intermediation. OCTA denotes the operating cost to total assets ratio. CTI represents the cost-to-income ratio. Crisk1 denotes credit risk, which is measured as NPL divided by gross loans. Crisk2 also denotes credit risk and is measured as provision for loan losses divided by NPL. CTA denotes capital-to-assets ratio. CAR represents the capital adequacy ratio, which is measured as regulatory capital divided by risk-weighted assets. BCR3 denotes bank concentration ratio, which is measured as the sum of the largest three banks' assets divided by total assets. BSD represents banking sector development and is measured as bank deposits divided by GDP. GDP represents annual GDP growth rate. Inflation represents the inflation rate. VIF denotes variance inflation factor. **, and * denote correlation between variables are significant at 1%, and 5%, respectively.

Table 5. Regression results

Variables	POLS				Fixed-effect				Random-effect			
	Dependent variable = CFI				Dependent variable = CFI				Dependent variable = CFI			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ID	-0.07**	-0.024	-0.070**	-0.073**	-0.102**	-0.075**	-0.102**	-0.102**	-0.087**	-0.064**	-0.088**	-0.092**
OCTA	0.799**		0.828**	0.882**	0.579**		0.570**	0.620**	0.714**		0.719**	0.745**
CTI		0.007				0.028**				0.019**		
Crisk1	0.001	0.004			0.016	0.043**			0.003	0.032**		
Crisk2			0.005*	0.006**			-0.004	-.003			-0.003	-0.003
CTA	0.094**	0.195**	0.095**		0.039	0.049	0.012		0.072*	0.116**	0.718*	
CAR				0.049**				0.023				0.046*
Liquidity	0.023**	0.020*	0.023**	0.021**	0.017**	0.002	0.023**	0.022**	0.021**	0.009	0.027**	0.021**
BCR3	0.02**	0.024**	0.016**	0.016**	0.026**	0.026	0.024**	0.024**	0.204**	0.025***	0.019**	0.019**
BSD	-0.006	-0.036**	0.001	-0.001*	-0.009	-0.028	-0.013	-0.011	-0.009	-0.035***	-0.006	-0.021
GDP	-0.05**	-0.064	-0.059*	-0.052*	0.010	-0.077**	-0.005	-0.004	-0.021	0.046	-0.029	-0.021
Inflation	0.04**	0.062**	0.040**	0.038**	0.027*	0.018	0.030*	0.031*	0.033*	0.028	0.035**	0.035**
Constant	4.009*	5.411**	4.098**	4.279*	7.383**	10.883**	8.017**	7.490**	5.556**	9.117**	5.568**	5.763**
R-squared	0.774	0.524	0.783	0.791	0.639	0.124	0.635	0.681	0.758	0.345	0.759	0.763
F-stat	88.81**	27.15**	84.24**	91.25**	25.54**	16.90**	22.49**	25.49**				
Wald – test									386.07**	153.98**	365.20**	381.44**

Hausman-	40.25**	99.26**	39.11**	34.63**				
tests								
Breusch-					176.15**	22.50**	22.51**	24.69**
Pagan								
LM tests								

Note: POLS denotes pooled least squares. CIF denotes cost of financial intermediation. OCTA denotes operating cost to total assets ratio. CTI represents the cost-to-income ratio. Crisk1 denotes credit risk, which is measured as NPL divided by gross loans. Crisk2 also denotes credit risk and is measured as provision for loan losses divided by NPL. CTA denotes capital-to-assets ratio. CAR represents capital adequacy ratio, is measured as regulatory capital divided by risk weighted assets. BCR3 denotes bank concentration ratio, which is measured as the sum of the largest three banks' assets divided by total assets. BSD represents banking sector development and is measured as bank deposits divided by GDP. GDP represents annual GDP growth rate. Inflation represents the inflation rate. **, and * denote correlation between variables are significant at 1% and 5%, respectively

5. DISCUSSION

Findings revealed that bank diversification reduces CFI in LMIC. This finding is similar to the findings of Rahman et al. (2018), Karikari et al. (2023), and Afrin et al. (2022). However, our result deviates from the finding of Rahman et al. (2023). This finding indicates that the bank moving from interest-generating activities to modern fee and commission generating activities compensates for the lower profit and still can hold the same overall profitability and charge lower interest margins to borrowers, which increases debt service capacity and decreases loan default rates. The findings indicate that inefficiency contributes to an increase in the CFI. This result is consistent with the findings of Gounder and Sharma (2012), Islam and Nishiyama (2015), and Afrin et al. (2022). This finding differs from the earlier findings of Rahman et al. (2023) and Karikari et al. (2023). This finding suggests inefficient banks impose higher interest margins on their valuable customers to recover increased overhead costs. Findings also indicated that credit risk increases CFI. This result supports the previous findings of Gounder and Sharma (2012). This finding, however, contradicts the earlier results reported by Afrin et al. (2022) and Rahman et al. (2023). This finding indicates that increased loan defaults diminish bank profitability, which is offset by imposing higher interest margins on borrowers. Risk aversion also increases the CFI, indicating that an increase in the equity capital base raises the cost of funds even though it reduces banks' risk and imposes higher interest margins on borrowers. This finding supports the earlier studies of Islam and Nishiyama (2015), Rahman et al. (2018), and Rahman et al. (2023).

The findings indicate that liquidity also enhances CFI. This finding reinforces the conclusion drawn by Nishiyama (2015), Gyeke-Dako et al. (2018), and Karikari et al. (2023). However, this finding differs from that of Gounder and Sharma (2012). It suggests that maintaining elevated liquidity levels diminishes banks' income, which is compensated for by imposing higher interest margins on borrowers. Bank concentration (BCR3) similarly contributes to an increase in CFI. The results align with the findings of Gounder and Sharma (2012), Rahman et al. (2018), Gyeke-Dako et al. (2018), Mia (2023), and Karikari et al. (2023). This study did not support the findings of Rahman et al. (2018). This indicates that the bank will likely impose a higher interest margin due to its significant market power. In contrast, BSD reduces CFI. This finding substantiates the results obtained in previous studies by Gyeke-Dako et al. (2018), Das Gupta et al. (2021), and Mia (2023). This outcome indicates that banks exhibit greater efficiency, operate at reduced costs, and generate equivalent net interest margin levels by imposing lower interest margins in developed financial systems. The results indicate that

inflation positively affects the CFI. This result aligns with the findings of Karikari et al. (2023) and Mia (2023). However, this result does not align with the findings of Das Gupta et al. (2021) and Rahman (2023). An increase in the inflation rate diminishes banks' real rate of returns, prompting them to offset this shortfall by imposing higher interest margins on borrowers. The results indicated that GDP growth negatively affects CFI. This concurrent finding aligns with the Das Gupta et al. (2021) results. This finding contrasts with the outcomes reported by Karikari et al. (2023) and Mia (2023). This outcome indicates that elevated economic growth enhances savings, allowing banks to acquire deposits at a reduced rate, which may lead to decreased CFI.

6. CONCLUSION

This study examines how risk aversion, efficiency, credit risk, diversification, liquidity, industry-specific factors, and macroeconomic conditions influence the cost of financial intermediation (CFI) in lower-middle-income countries (LMIC). The analysis utilizes secondary data from the World Bank from 2000 to 2021. Using a fixed-effect estimator, this study concludes that diversification reduces CFI, suggesting that diversified banks earn more income through nontraditional businesses and hold the same profitability. However, they charge borrowers lower interest margins. Conversely, bank concentration, inefficiency, liquidity, and risk aversion increase CFI, suggesting that in a less competitive banking environment, they become less efficient, hold larger amounts of liquidity, hold more costly equity funds, and charge higher interest margins to borrowers, which raises the cost of borrowing and leads to an increase in loan defaults. The BSD decreases the CFI, reducing the interest margin and decreasing the loan default. In addition, inflation increases the CFI, suggesting that an inflation rate diminishes banks' real rate of returns, prompting them to offset this shortfall by imposing higher interest margins on borrowers. Finally, GDP growth decreases the CFI, indicating that an increase in GDP enhances savings, allowing banks to acquire deposits at a reduced rate, which may lead to decreased CFI.

This study presents several policy implications from our findings, particularly emphasizing lower-middle-income countries. The findings indicate that diversification may reduce CFI, subsequently lowering funding costs and encouraging more investment. Therefore, policymakers can introduce tax incentives and low-interest loan programs to enhance their diversification efforts. In a similar vein, by lowering entry barriers, policymakers can encourage competition to improve efficiency and diversification. In order to reduce the need for higher liquidity and equity capital, policymakers should encourage banks to increase the number of depositors and reduce their reliance on a small number of large deposits. They should also implement monetary policies intended to lower inflation, promote economic growth, and aid in the flourishing of the banking industry.

This study excludes two important factors of the dealership model: transaction size and interest rate volatility. Furthermore, it does not include institutional factors, such as the rule of law, control of corruption, regulatory quality, political stability, economic freedom, globalization, etc. Similarly, it does not include high—and upper-middle-income countries in the sample. Hence, further study can be conducted by adding these abovementioned variables

and using more robust econometric estimators, which can improve the generalizability power of the study.

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