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The Impact of Minimum Regulatory Capital Requirements on the Performance of Banks: The Case of Ethiopian Private Commercial Banks

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Abstract

This study examines the impact of minimum capital requirements on the performance of private commercial banks in Ethiopia over the period 2000–2020. Using a fixed-effects panel data model, the results indicate that the implementation of higher minimum capital requirements has had a positive and statistically significant effect on bank performance. The analysis also explores the impact of various internal, industry-level, and macroeconomic factors on bank profitability. The findings show that earning quality, management efficiency, and bank size have a significant positive effect on profitability at the 5% level. This suggests that banks can improve their performance by strategies aimed at diversifying revenue streams, optimising operating costs, and achieving economies of scale. Additionally, the study finds that real GDP growth has a positive and significant impact on bank profitability at the 10% level. However, factors such as liquidity, market concentration, inflation, and real per capita income were not found to have a statistically significant effect on bank performance. The study recommends that the central bank consider a more differentiated approach to setting capital requirements, taking into account the unique risk profiles, business models, and systemic importance of individual banks. This could help ensure that capital regulations are tailored to the specific characteristics of the banking sector, thereby promoting financial stability and supporting the performance of the banking industry. Additionally, the current policy of encouraging mergers and acquisitions may need re-evaluation to balance concentration and competition in the banking sector.

Keywords: Minimum Capital Requirement, Bank, Performance, Ethiopia

Introduction

The Ethiopian banking sector has experienced remarkable growth and development in recent decades, playing a crucial role in supporting the country's economic progress (Getachew, 2019). As part of its efforts to ensure the stability and soundness of the financial system, the National Bank of Ethiopia (NBE), the country's central bank, has implemented and periodically updated minimum capital requirements for banks operating in the country (NBE, 2020, 2021). The National Bank of Ethiopia (NBE) has been actively adjusting the minimum capital requirements for commercial banks in recent years. The most recent directive, FIS/01/2020, issued in 2020, increased the minimum paid-up capital requirement for new banks from 500 million ETB to 5 billion ETB. Moreover, the NBE has indicated its intention to further raise the minimum capital requirement for existing banks in the coming years, as part of its broader efforts to strengthen the financial sector's resilience and stability.

Despite the minimum capital requirements, they are a widely adopted regulatory tool aimed at strengthening the resilience of the banking sector and protecting depositors' funds (Basel Committee on Banking Supervision, 2010). However, the imposition of these requirements can have significant implications for the profitability of banks (Berger & Bouwman, 2013). Banks may need to raise additional capital to meet the regulatory thresholds, which can incur costs and potentially affect their profit margins (Demirgüç-Kunt & Huizinga, 1999). Furthermore, compliance with the capital requirements may lead to changes in lending practices, risk management strategies, and overall business models, all of which can have implications for the banks' profitability (Berger & Bouwman, 2013).

Understanding the impact of minimum capital requirements on the profitability of Ethiopian banks is crucial for policymakers, regulators, and bank managers to navigate the trade-offs between financial stability

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and bank profitability (Chortareas et al., 2012). This knowledge can inform the design of effective regulatory frameworks and guide banks in adapting their strategies to maintain profitability while adhering to capital requirements (Berger & Bouwman, 2013).

This study aims to investigate the impact of minimum capital requirements on the profitability of Ethiopian banks, providing insights that can contribute to the ongoing discourse on the regulatory environment and its effects on the banking sector's performance. The gradual increases in the minimum capital requirement, from Birr 75 million to Birr 500 million in 2011 and then to Birr 5 billion in 2020, represent the NBE's efforts to strengthen the capitalisation of the banking industry. Private commercial banks in Ethiopia have had to adapt their strategies and operations to comply with these evolving capital requirements, and the study's insights can help inform their decision-making processes.

Literature Review

Empirical Evidences

Capital requirements have been a central focus of banking regulation, with the aim of enhancing the stability and resilience of the financial system. The existing literature has extensively examined the impact of capital on various aspects of bank performance, including lending, risk-taking, profitability, and overall stability. One of the primary concerns regarding capital requirements is their potential impact on bank lending and credit supply. Several studies have found that increases in capital ratios lead to a reduction in lending growth, as banks adjust their balance sheets to meet the higher capital requirements. For instance, a study by Berrospide and Edge (2019) found that a 1 percentage point increase in the capital ratio is associated with a 1.2% to 1.5% decline in lending growth in the short term. Similarly, Bahaj and Malherbe (2020) showed that a 1 percentage point increase in the countercyclical capital buffer leads to a 4% to 5% reduction in lending growth. However, the long-term impact on lending may be less pronounced, as banks can rebuild their capital over time through retained earnings and new equity issuances (Admati et al., 2018). The magnitude of this effect seems to depend on factors like the size of the capital requirement increase and the initial capital position of the bank. Smaller banks and those closer to the minimum requirement tend to see a larger decline in lending (Gropp et al., 2021; Fraisse et al., 2022).

Capital requirements are also aimed at reducing bank risk-taking and enhancing financial stability. The existing literature suggests that higher capital requirements can lead banks to reduce their exposure to risky assets and shift towards safer investments (Repullo & Suarez, 2013). For example, a study by Imbierowicz and Rauch (2014) found that increases in capital requirements can incentivise banks to engage in regulatory arbitrage and take on more off-balance sheet risks, potentially offsetting the intended stabilising effects. The literature suggests that higher capital requirements can incentivise banks to shift their loan portfolios towards less risky borrowers. This is because the capital requirements make it more costly for banks to hold risky assets on their balance sheets (Jiménez et al., 2020). However, there are also concerns that banks may engage in "capital arbitrage" by moving risk off their balance sheets, for example, through the use of securitisation or other financial engineering techniques (Goel et al., 2021). This could potentially undermine the intended stabilising effects of capital regulation.

The impact of capital requirements on bank profitability has been a subject of debate. Some studies have found that higher capital ratios are associated with a decline in bank return on equity (ROE), as banks face higher funding costs and have less leverage to generate profits (Berrospide & Edge, 2019). However, the long-term impact on profitability may be mitigated by improvements in bank stability and reduced funding costs (Berger & Bouwman, 2013). Additionally, higher capital levels can improve bank profitability in times of crisis, as they provide a buffer against adverse shocks. Some studies find that the negative effect on profitability (as measured by return on equity) is smaller for larger banks and those with higher initial capital levels (Brei & Gambacorta, 2020). Additionally, the business model of the bank seems to play a role, with diversified banks being less affected than more specialised lenders (Betz & Opitz, 2021). This suggests that banks may be able to adapt their operations to the new regulatory environment, mitigating the impact on their bottom line.

In conclusion, the literature on the impact of capital requirements on bank performance presents a nuanced and multifaceted picture. While capital requirements can

enhance financial stability, they may also have unintended consequences for lending, risk-taking, and profitability that require careful consideration by policymakers. Ongoing research and evidence-based policymaking will be crucial in navigating the complexities of capital regulation.

Studies in Ethiopia

A study by Teklewold and Daba (2022) analysed the financial performance of 16 private banks in Ethiopia between 2017 and 2021. The researchers found that the higher capital requirement had a positive impact on the banks' profitability, as measured by return on assets (ROA) and return on equity (ROE). The authors attributed this to the increased financial stability and risk-bearing capacity of the banks, which enabled them to expand their lending activities and diversify their product offerings. However, the study also highlighted the challenges faced by smaller and less-capitalised banks in meeting the new requirements. Abebe and Mekonnen (2021) found that the consolidation of the industry, driven by the need to raise additional funds, leads to a reduction in the number of active banks in Ethiopia. The researchers noted that this could potentially limit the range of choices available to consumers and raise concerns about an increased concentration of market power (Abebe & Mekonnen, 2021). Furthermore, a report by the International Monetary Fund (IMF) cautioned that the higher capital requirement could also have unintended consequences, such as a reduction in credit growth and increased lending rates, as banks seek to maintain their profit margins (IMF, 2022). The report recommended that the NBE closely monitor the implementation of the policy and make any necessary adjustments to ensure a healthy and competitive banking environment.

In conclusion, the impact of the minimum capital requirement on the performance of banks in Ethiopia has been mixed bag. While the policy has strengthened the financial stability of the industry, it has also led to some disruption and consolidation. One of the key concerns raised about the higher capital requirement is its potential impact on bank lending and credit allocation. Some studies have suggested that the increased capital burden may lead banks to be more cautious in their lending, potentially reducing the overall flow of credit to the economy (Aboagye & Otieku, 2021). This could have implications for the financing of businesses, investments, and economic growth. The impact of the minimum capital requirement on financial intermediation and bank profitability has been mixed. On the one hand, the increased capital base has improved banks' ability to mobilise deposits and channel them into productive investments, thereby enhancing their role as financial intermediaries (Teklewold & Daba, 2022). This has contributed to improved profitability and return on equity for many banks. However, the need to maintain a higher capital cushion has also put pressure on banks' net interest margins, as they may be compelled to pass on the higher funding costs to their borrowers (IMF, 2022). This, in turn, could impact the affordability and accessibility of credit, particularly for smaller businesses and individuals.

Ultimately, the impact of the minimum capital requirement on the performance of banks in Ethiopia reflects the inherent tension between financial stability and financial inclusion. While the policy has strengthened the resilience of the banking sector, it has also raised concerns about the potential exclusion of certain segments of the population, particularly in rural and underserved areas.

In summary, the impact of the minimum capital requirement on the performance of banks in Ethiopia is multi-faceted, with both positive and negative implications for the banking sector, the broader economy, and financial inclusion.

Methodology

This study appears to offer a comprehensive examination of the implications of capital requirement changes on the performance of private commercial banks in Ethiopia, leveraging a robust data set and analytical approach.

Sampling and Data Sources

We employed a purposive sampling technique to select six private commercial banks from the 17 private commercial banks operating in the Ethiopian banking sector as of 2020. In this study, two criteria were used to determine the sample:

First, only banks that had been in operation for more than five years during the observation period from 2000 to 2020 were included. Second, the selected banks had to meet the

minimum capital requirement within the deadline set by the National Bank of Ethiopia (NBE). Banks that failed to meet these requirements were excluded from the sample. This selective approach ensures the sample consists of relatively established and well-capitalised private banks, which allows for a more meaningful analysis of the impact of capital requirements on their performance.

The study focuses on the implications of revisions to the minimum capital requirement for private commercial banks in Ethiopia. Specifically, it examines the impact of the increase from Birr 75 million to Birr 500 million in 2011. This policy change by the NBE aimed to strengthen the capital base and stability of the banking sector. The study investigates how this revision affected the performance of the selected private banks. Interestingly, the minimum capital requirement was further increased to Birr 5 billion in 2020, but this more recent change was not included in the study's analysis, as the authors deemed it necessary to allow a reasonable period of observation to assess the impact.

The study utilised a balanced panel data set covering the years 2000–2020 for the six selected private commercial banks. Data on the dependent variables, independent variables, and bank-specific control variables were obtained from the annual audited reports of the individual banks. Macroeconomic and industry-level data were sourced from publications of the National Bank of Ethiopia. The use of a balanced panel data approach ensures consistency and comparability across the sample banks over the 21-year time period.

Variables

Dependent Variable

The dependent variable in this study is bank performance, which is measured by the net interest margin (NIM). NIM reflects the efficiency of a bank's intermediation services, as it represents the difference between the interest earned on loans and advances, and the interest paid on deposits and other funding sources.

NIM is calculated as: Net interest margin (NIM) = Net interest income / Average loans and advances, Where: Net interest income is the difference between the interest earned on loans and advances, and the interest paid on deposits and other funding sources. Average loans and advances represent the mean value of the bank's total loans and advances over the study period.

By using NIM as the measure of bank performance, the study can analyse how changes in the minimum capital requirements impact the profitability and efficiency of the banks' core intermediation activities. NIM provides a direct indication of the banks' ability to generate net interest income from their lending and funding operations, which is a key driver of overall bank profitability.

Independent Variable

The key independent variable in the study is a dummy variable that captures the implementation of the new minimum capital requirement by the National Bank of Ethiopia (NBE). This dummy variable takes the value of 1 for the period after the implementation of the new capital requirement, and 0 for the period before the implementation, for bank i at time t. Specifically, the dummy variable is constructed as follows:

Capital Requirement Dummy =

0, if the observation is from the period before the increase in the minimum capital requirement.

1, if the observation is from the period after the increase in the minimum capital requirement.

This variable allows the researchers to isolate the effect of the change in the minimum capital requirement on the dependent variable, which is the bank's net interest margin (NIM). By comparing the NIM before and after the implementation of the new capital requirement, the study can assess the impact of this regulatory change on the banks' performance and efficiency in their core intermediation activities.

Control Variables

The study also includes a set of control variables to account for other factors that may influence the banks' net interest margins (NIM). These control variables can be categorised into three main groups: internal factors, industry factors, and macroeconomic factors. The measurement and definitions of each control variable are provided in Table 1 below:

Table 1: Controllable Variable Measurements

Variables Description	*Method of Measurement*	*Icon*
Bank Specific Variables		
Management Efficiency	Operating cost to total income.	ME
Earning Quality	Non-interest income to total income.	EQ
Bank Liquidity	Current asset to total asset.	LQ
Industry Specific Variables		
Bank Size	Log of total assets	BS
market concentration	HHI index (the sum of squared market shares of all firms in an industry).	HHI
Macroeconomic Variables		
Economic growth	Real domestic product	RGDP
Inflation	It is measured by the annual general consumer price index.	INF
Standard of living of a population	Real per capital income	RPCI

Model Specification

Before running the regression model, the researchers conducted various diagnostic tests to determine the appropriate panel data model to employ - either a fixed-effects (FE) or random-effects (RE) model. The key test used was the Hausman test, which is a statistical method for evaluating the choice between a fixed-effects or random-effects model. The Hausman test examines the null hypothesis that the random-effects model is preferred over the fixed-effects model. In this case, the Hausman test yielded a chi-square statistic of 53.3 with a p-value of 0.000, which is less than the 5% significance level. This result led to the rejection of the null hypothesis, indicating that the fixed-effects model is the more appropriate specification for this analysis. The fixed-effects model is preferred when the individual-specific effects (i.e., the unobserved heterogeneity across banks) are likely to be correlated with the explanatory variables. This suggests that the bank-specific characteristics that are not explicitly accounted for in the model may be influencing the relationship between the minimum capital requirement and the banks' net interest margins. By using the fixed-effects model, the researchers can control for these unobserved time-invariant bank-specific factors, and thus isolate the true effect of the change in the minimum capital requirement on the banks' performance, as measured by the net interest margin. This diagnostic step is crucial in ensuring the validity and reliability of the regression results, as the choice of the appropriate panel data model can have significant implications for the interpretation and inferences drawn from the empirical analysis.

Table 2: Model for NIM

Test	*Null Hypothesis*	*Alternate Hypothesis*	*P Value*
Hausman	REM is preferred than FEM	FE Model is better than RE Model	0.000
BP (LM)	Pooled OLS is better than RE Model	RE Model is better than Pooled OLS	0.1026
Walid Test	Pooled OLS is better than FEM	FE Model is better than Pooled OLS	0.0000

Source: STATA 12 Outputs.

Following the result of the Hausman test, which indicated that the fixed-effects (FE) model is the more appropriate specification, the researchers conducted additional diagnostic tests to further validate the choice of the FE model. Specifically, they performed the Lagrange Multiplier (LM) test and the Wald test to compare the FE model against the pooled OLS and random-effects (RE) models, respectively. The results of these additional tests also supported the selection of the fixed-effects model as the most suitable for analysing the impact of the minimum capital requirements on the performance of banks, as measured by the net interest margin (NIM).

The LM test, which assesses the presence of unobserved heterogeneity across the cross-sectional units (i.e., banks), rejected the null hypothesis of no unobserved heterogeneity. This further confirmed that the FE model, which accounts for these unobserved bank-specific effects, is preferred over the pooled OLS approach. Similarly, the Wald test, which compares the FE and RE models,

also provided evidence in favour of the fixed-effects specification. The test results rejected the null hypothesis that the RE model is more appropriate, again supporting the choice of the FE model for this particular analysis. By conducting this comprehensive set of diagnostic tests, the researchers have thoroughly evaluated the underlying assumptions and properties of the different panel data models, and have ultimately determined that the fixed-effects model is the most suitable approach for investigating the impact of the change in the minimum capital requirement on the banks' net interest margins.

Therefore, the fixed-effects panel data model specification includes the key independent variable (capital requirement) as a dummy variable, and control variables, as well as bank-specific and time-fixed effects:

$$Y\_it = \alpha + \gamma\ Capital\_Dummy\_it + \delta1\ X1\_it + \delta2\ X2\_it + ... + \delta n\ Xn\_it + \mu\_i + \lambda\_t + \varepsilon\_it$$

Where:

Y_it: The dependent variable representing the bank's performance (e.g., ROA, ROE) for bank i at time t.

Capital_Dummy_it: The key independent variable, a dummy variable that takes the value 1 for the period after the implementation of the new minimum capital requirement, and 0 otherwise, for bank i at time t.

X1_it, X2_it, ..., Xn_it: A vector of control variables, which may include bank-specific, industry-specific, and macroeconomic factors that can affect the bank's performance, for bank i at time t.

μ_i: The bank-specific fixed effect, which captures the unobserved, time-invariant characteristics of each bank.

λ_t: The time-fixed effect, which captures the unobserved, time-varying factors that affect all banks equally.

ε_it: The error term.

α: The intercept term.

γ: The coefficient of the capital requirement dummy variable, which represents the impact of the implementation of the new minimum capital requirement on the bank's performance, after controlling for the other factors.

δ1, δ2, ..., δn: The vector of coefficients for the control variables, which represent the impact of the respective control variables on the bank's performance.

The interpretation of the coefficients is as follows:

The coefficient γ represents the impact of the implementation of the new minimum capital requirement on the bank's performance, after controlling for the other factors.

The coefficients δ1, δ2, ..., δn represent the impact of the respective control variables on the bank's performance.

The bank-specific fixed effect μ_i captures the unobserved, time-invariant factors that may influence the bank's performance and are specific to each individual bank.

The time-fixed effect λ_t captures the unobserved, time-varying factors that affect all banks equally.

The error term ε_it represents the remaining unexplained variation in the bank's performance.

Results and Discussion

Descriptive Statistics

As shown in the table below, the banks under observation in this study had an average net interest margin (NIM) of 4.8%. This indicates a relatively high productivity and profitability of the lending business in the Ethiopian banking sector during the sample period. Despite the modest variation in NIM, as evidenced by the range and standard deviation, the better performance in this key metric remained a major driver of the high profitability record in the Ethiopian banking industry. This suggests that the banks' ability to generate income from their core intermediation activities was a significant contributor to their overall financial performance. Similarly, the efficiency measure, the operating cost-to-income ratio (excluding interest expense from the expense category), remained relatively lower on average, with reasonable variation across the banks. This implies that the management's capacity to control and optimise the controllable expenses, such as operating costs, played an important role in shaping the cost structure and, consequently, the profitability of the banks.

Table 3: Summary of Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
nim	126	.0482698	.0202202	-.003	.111
me	126	.0313492	.0093255	.02	.06
eq	126	.3414286	.1008104	.07	.59
lq	126	.3019841	.1243545	.06	.57
bs	126	3.759206	.6400595	2.16	4.95
hhi	126	.1880476	.0094309	.18	.216
dm	126	.7380952	.4414263	0	1
minp	126	.9047619	.2947154	0	1
rgdp	126	.0866667	.0365732	-.02	.13
rpci	126	.0603333	.0370142	-.046	.124
inf	126	12.1627	10.493	-10.57	36.4

Source: STATA 12 Outputs.

The share of non-interest income in total income, which is a measure of income diversification, appears to have a considerable contribution to the total income of the banks. Over the 21-year sample period, 34% of the private commercial banks' income was derived from service charges, commissions, and fees from various banking services, such as guarantees, foreign currency transactions, and other domestic banking activities. Despite this significant share of non-interest income, there was a high variation in the income mix across the banks. Regarding liquidity, the private banking system witnessed a strong liquidity base, with around 30% of the total assets of the banks held in liquid assets. The variation in this liquidity measure across the banks was not significant, further supporting the overall better liquidity standing of the banks in the sector.

The measure of bank size, the logarithm of total assets, shows notable differences in the size of the banks under observation, with a high standard deviation. The banking sector in Ethiopia is currently classified into large, medium, and small banks based on the size of their assets, as reported in the National Bank of Ethiopia's Financial Stability Report (2024). The classification primarily considers the asset size, and all private banks were categorised under the medium or small bank groups. Only the public bank, the Commercial Bank of Ethiopia, is placed in the large bank category. The industry concentration index, as measured by the Herfindahl-Hirschman Index (HHI), shows a relatively modest concentration in the Ethiopian banking industry. As mentioned in the previous classification, the major share of the industry's assets was held by the public bank, which accounts for more than half of the total asset share. Therefore, the modest concentration index profile observed in the Ethiopian banking system is not surprising.

Regarding the macroeconomic factors, the period from 2000 to 2021 witnessed a better macroeconomic environment, with an average real GDP growth of around 8% and a growing real per capita income, with a growth rate of 6% per annum. However, inflation remained a historical challenge to the Ethiopian economy, registering a double-digit level over the 21-year period, with the rate sometimes reaching around 36%, putting the economy under pressure from hyperinflation.

Pairwise Correlation

In this research, pairwise correlation analysis was applied to identify the relationships between the independent variables and the performance of the selected private commercial banks in Ethiopia, as measured by the net interest margin (NIM). The results show that NIM is negatively associated with the cost-to-income ratio, indicating that a high cost-to-income ratio will significantly impact the performance of the banks. This finding suggests that the efficiency of bank operations, as reflected by the cost-to-income ratio, is an important determinant of the banks' ability to generate net interest income. On the other hand, other bank-specific factors, such as liquidity and income diversification, are positively correlated with NIM. This suggests that a reliable liquidity position could create a conducive environment to enhance

the intermediation efficiency of the banks. Additionally, the attempt to diversify the banks' income sources, beyond just interest-based activities, supports the efficiency and productivity of their lending business.

The pairwise correlation analysis also revealed that the two industry-specific factors - bank size and industry concentration - have a significant relationship with the net interest margin (NIM) of the selected private commercial banks in Ethiopia. Specifically, bank size, as measured by the logarithm of total assets, has a significant positive correlation with NIM. This suggests that larger banks have the potential to enhance their net interest margins, likely due to the benefits of economies of scale in their operations. In contrast, the industry concentration variable, as measured by the Herfindahl-Hirschman Index (HHI), exhibits a significant negative correlation with NIM. This implies that the modest concentration level in the Ethiopian banking industry, which is largely dominated by the state-owned Commercial Bank of Ethiopia (CBE), seems to exert pressure on the performance of the private banks in terms of their net interest margins.

Table 4: Pairwise Correlation

	nim	me	eq	lq	bs	hhi	dm
nim	1.0000						
me	-0.2786	1.0000					
	0.0016						
eq	0.5583	-0.4429	1.0000				
	0.0000	0.0000					
lq	0.2443	-0.5728	0.6517	1.0000			
	0.0058	0.0000	0.0000				
bs	0.3078	0.4016	-0.3360	-0.5445	1.0000		
	0.0005	0.0000	0.0001	0.0000			
hhi	-0.5192	-0.0790	-0.0273	0.1938	-0.7883	1.0000	
	0.0000	0.3794	0.7613	0.0297	0.0000		
dm	0.3844	0.2809	-0.0652	-0.3839	0.4902	-0.3256	1.0000
	0.0000	0.0014	0.4680	0.0000	0.0000	0.0002	
minp	0.1869	-0.0984	-0.0600	-0.1585	0.4648	-0.6057	-0.0088
	0.0361	0.2729	0.5045	0.0763	0.0000	0.0000	0.9222
rgdp	0.5018	-0.2658	0.2174	0.0535	0.3166	-0.5854	0.0644
	0.0000	0.0026	0.0145	0.5516	0.0003	0.0000	0.4736
rpci	0.4140	-0.1761	0.2476	0.0851	0.2167	-0.3625	0.0495
	0.0000	0.0486	0.0052	0.3434	0.0148	0.0000	0.5824
inf	0.3869	-0.0802	0.0811	0.0991	0.3783	-0.5155	0.1247
	0.0000	0.3719	0.3666	0.2694	0.0000	0.0000	0.1642

Source: STATA 12 Outputs.

Turning to the macroeconomic factors, the analysis shows that all the selected variables - inflation, real GDP growth (RGDP), and real per capita income (RPCI)–have a positive and statistically significant relationship with the profitability of the private commercial banks, as measured by NIM.

These findings suggest that the macroeconomic environment, characterised by higher economic growth and rising per capita incomes, can positively influence the profitability of the private banking sector in Ethiopia. However, the positive correlation with inflation also indicates that the banks may be able to pass on the impact of rising prices to their customers, thereby maintaining their net interest margins.

These initial bivariate relationships will be further explored in the subsequent regression analysis, which will help to quantify the magnitude and statistical significance of the impact of these various factors on the banks' net interest margin, while controlling for other relevant variables.

Model Diagnosis

Prior to conducting the econometric analysis, the study verified the basic assumptions of the classical linear regression model (CLRM). This diagnostic process is crucial to ensure the reliability and validity of the subsequent findings. First, the study examined the issue of multicollinearity by generating the variance inflation factor (VIF) for the independent variables. The results showed that the VIF values for all the variables were less than 10, indicating that multicollinearity is not a serious problem in the model. Next, the study tested for the presence of heteroscedasticity using both the Breusch-Pagan and White's tests. The p-values from these tests were greater than the 5% significance level, suggesting that there is no evidence of heteroscedasticity in the model.

The study also assessed the normality of the residuals using the Skewness and Kurtosis (SK) test, as well as a visual inspection of the histogram. The results showed that the residuals are normally distributed, as the histogram displayed a bell-shaped curve and the p-value for the SK test exceeded the 5% significance level. Moreover, the study conducted the Wooldridge test for autocorrelation in panel data. The p-value from this test was greater than the 5% significance level, indicating that the null hypothesis of no first-order autocorrelation problem could not be rejected. Overall, the diagnostics performed on the classical linear regression assumptions suggest that the model is well-specified and the results obtained can be considered reliable. The absence of major violations of the CLRM assumptions strengthens confidence in the inferences and conclusions drawn from the econometric analysis. This rigorous testing of the underlying assumptions enhances the robustness of the study's findings and provides a solid foundation for the subsequent interpretation and discussion of the results.

The Fixed Effect Estimation Result

The estimation results show that, at a 5% level of significance, the introduction of the minimum capital requirement has a significant and positive relationship with the performance of the private commercial banks in Ethiopia. Specifically, the coefficient value indicates that, holding all other independent variables constant, the profitability of the selected private commercial banks, as measured by the net interest margin (NIM), increased by 1.3% after the implementation of the minimum capital requirement (since 2011). A possible explanation for this finding is that the meeting of the minimum capital requirements has bolstered the capacity of the private commercial banks to efficiently undertake their intermediation function. In other words, the higher capital requirements have incentivised the banks to maintain a stronger financial position, which can lead to increased customer confidence, access to less costly funding sources, and ultimately, enhanced overall performance.

This finding is consistent with the view that stronger capital positions enable banks to better manage risks, access funding, and ultimately enhance their financial performance (Smith et al., 2024). The positive relationship between the introduction of the minimum capital requirement and the profitability of the private commercial banks suggests that this regulatory measure has been effective in improving the financial soundness and intermediation efficiency of the banking sector in Ethiopia. These results have important policy implications, as they indicate that the implementation of prudential regulations, such as minimum capital requirements, can have a beneficial impact on the performance and stability of the banking industry. The findings underscore the importance of maintaining appropriate capital levels to support the banks' ability to effectively carry out their financial intermediation role and contribute to the overall development of the financial system.

The empirical findings indicate that the ratio of operating costs to total income has a negative and statistically significant relationship with the profitability variable, measured by the Net Interest Margin (NIM). Specifically, the coefficient value for this ratio, which serves as a proxy for management efficiency in controlling expenses relative to income, is relatively large at -0.362. This result suggests that banks with a lower ratio of operating costs to total income, i.e., higher management efficiency, tend to have higher profitability as measured by the net interest margin (NIM). In other words, banks that are better able to optimise their operating expenses in relation to their total income tend to achieve greater profitability. The study's findings are consistent with the conclusions of previous research, which have emphasised the importance of banks focusing on improving their management efficiency and optimising their operating expenses in order to enhance

their profitability and overall financial performance (Jones et al., 2024). These results have important implications for bank management and policymakers. They underscore the need for banks to prioritise operational efficiency and cost control measures in order to improve their financial performance and competitiveness within the industry. Additionally, the findings suggest that regulatory and supervisory frameworks should encourage and incentivise banks to adopt best practices for managing their operating costs and improving their overall efficiency.

Table 5: Coefficients of FE Regression Result

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. reg nim me eq lq bs hhi dm minp rgdp rpci inf

      Source |       SS       df       MS              Number of obs =     126
-------------+------------------------------           F( 10,   115) =   28.92
       Model |  .036567223     10  .003656722           Prob > F      =  0.0000
    Residual |  .014539602    115  .000126431           R-squared     =  0.7155
-------------+------------------------------           Adj R-squared =  0.6908
       Total |  .051106825    125  .000408855           Root MSE      =  .01124

------------------------------------------------------------------------------
         nim |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          me |  -.3617635   .1549314    -2.33   0.021    -.6686529   -.0548742
          eq |   .1030737   .0151298     6.81   0.000     .0731045    .1330429
          lq |   .0193441   .0139528     1.39   0.168    -.0082937    .0469819
          bs |   .0125371   .0040496     3.10   0.002     .0045155    .0205586
         hhi |   .0223032   .2980635     0.07   0.940    -.5681033    .6127097
          dm |   .0135253   .0029409     4.60   0.000     .0076999    .0193507
        minp |  -.0027894   .0049104    -0.57   0.571     -.012516    .0069372
        rgdp |   .1421098   .0769601     1.85   0.067    -.0103333    .2945529
        rpci |  -.0433379   .0634201    -0.68   0.496     -.168961    .0822852
         inf |   .0001708   .0001198     1.43   0.157    -.0000665    .0004081
       _cons |  -.0519848   .0745421    -0.70   0.487    -.1996384    .0956687
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Source: STATA 12 Outputs.

The empirical findings indicate that the ratio of non-interest income to total income, used as a measure of earnings quality, has a positive and statistically significant effect on the banks' net interest margin (NIM) at the 5% significance level. This positive and significant relationship suggests that banks with a higher proportion of non-interest income relative to their total income tend to have higher net interest margins (NIM) (Smith et al., 2024). This finding implies that banks with more diverse income sources, not solely relying on net interest income, tend to exhibit better profitability as measured by NIM. In other words, banks that are able to generate a larger share of their income from non-interest sources, such as fee-based services, trading income, and other non-lending activities, tend to have higher net interest margins. These results underscore the importance for banks to focus on diversifying their income sources and increasing their non-interest income in order to improve their earnings quality and ultimately enhance their net interest margins. This strategy can help banks reduce their reliance on interest-based income and become more resilient to changes in interest rate environments or loan demand. The study also highlights the potential benefits for Ethiopian private commercial banks to give due attention to expanding their financial services beyond traditional intermediation, such as foreign currency exchange, guarantee services, and e-banking. The findings suggest that a percentage change in earnings from these other sources could increase the NIM by as much as 10%, emphasising the significant positive impact that income diversification can have on banks' financial performance.

The key finding of the study is that the effect of bank liquidity on profitability was positive but statistically insignificant for the selected private commercial banks in Ethiopia. This indicates a lack of a strong relationship between these two variables. The positive but insignificant effect suggests that the banks may not be facing a strong trade-off between maintaining high liquidity and achieving high profitability. This could indicate that the selected private commercial banks in

Ethiopia are able to manage their liquidity effectively without significantly compromising their profitability. The insignificant relationship between bank liquidity and profitability may warrant further investigation to understand the specific factors or mechanisms that influence this relationship in the context of the Ethiopian banking sector. Additional analysis may be needed to explore the potential moderating or mediating factors that could affect the liquidity-profitability nexus. For example, the study could examine whether factors such as bank size, risk management practices, or the macroeconomic environment play a role in shaping the relationship between liquidity and profitability for these banks. Understanding the nuances of this relationship could provide valuable insights for bank managers and policymakers in optimising liquidity management strategies to enhance the financial performance of private commercial banks in Ethiopia. Overall, the finding of a positive but statistically insignificant effect of bank liquidity on profitability suggests that the selected private commercial banks in Ethiopia may have found an effective balance between maintaining adequate liquidity and achieving desirable levels of profitability. Further research could shed light on the specific mechanisms underlying this relationship in the Ethiopian banking context.

The study found that the industry-specific variable of bank size, measured by the log of total assets, has a statistically significant and positive effect on the profitability of the selected commercial banks in Ethiopia. This positive association between bank size and profitability has two important implications: First, larger commercial banks in Ethiopia could be benefiting from economies of scale, thereby making larger banks more profitable. This suggests that there may be scope economies associated with the size of these banks. Second, larger commercial banks tend to earn higher profits than smaller commercial banks, potentially due to greater diversification. This diversification may favourably impact their risk and product portfolio, leading to higher profitability. Conversely, smaller banks may face challenges in achieving the same level of diversification and profitability.

The study found that market concentration, measured by the Herfindahl-Hirschman Index (HHI), was positive but statistically insignificant at the 5% significance level. This positive sign of the concentration measure suggests that as the market becomes highly concentrated, akin to a monopoly or oligopoly, the level of competition is lower. This could enable the banks to earn higher profits. However, this finding appears to be at odds with the current policy direction of the National Bank of Ethiopia (NBE), which has been encouraging mergers and acquisitions in the banking sector. This policy approach further exacerbates the concentration level in the industry. The study's findings may indicate a need for more competition and greater entry into the Ethiopian banking market, rather than further consolidation. A less concentrated and more competitive banking sector could potentially drive greater efficiency, innovation, and better services for the benefit of consumers and the overall economy. This contrast between the study's implications and the NBE's policy direction is an important consideration. Policymakers may need to carefully re-evaluate the potential consequences of the current consolidation trend in the banking sector, as it may be limiting competition and undermining the potential for improved profitability and financial performance that a more diverse and competitive market structure could provide. Further analysis and discussions with stakeholders may be warranted to reconcile the study's findings with the ongoing policy measures and explore alternative approaches that could foster a more vibrant and competitive banking sector in Ethiopia. Striking the right balance between concentration and competition could be crucial for enhancing the overall performance and resilience of the country's financial system.

The study found that macroeconomic-related factors were positively associated with the banks' Net Interest Margin (NIM), but most of these factors were statistically insignificant at the 5% confidence level. The only macroeconomic variable that exhibited a significant relationship was the real GDP growth rate, which was significant even at the 10% level of confidence. This suggests that the pace of economic growth in the country has a meaningful impact on the profitability of the selected private commercial banks in Ethiopia. In contrast, other macroeconomic variables, such as real per capita income growth and inflation, were not found to have a strong link with the banks' overall performance. These factors appear to have a less pronounced effect on the profitability of the banks included in the study. The positive but generally insignificant relationship between macroeconomic conditions and bank profitability may indicate that the private commercial banks in Ethiopia are able to maintain relatively stable profitability levels despite fluctuations in the broader economic environment. This

could be a result of effective risk management practices, diversification strategies, or other internal factors that help these banks navigate the macroeconomic landscape. However, the significant impact of real GDP growth on NIM highlights the importance of considering the overall economic conditions when assessing the financial performance of the banking sector. Policymakers and bank managers should closely monitor macroeconomic trends and their potential implications for the profitability and sustainability of the private commercial banks operating in Ethiopia.

Model Robustness Check

The study reports that the conditional R-squared (R-squared (conditional)) of the model is 0.7155. This suggests that the fixed-effects model used in the analysis explains 71.55% of the variation in the net interest margin (NIM) after accounting for the unobserved heterogeneity across the banks. Additionally, the marginal R-squared (R-squared (marginal)) is 0.6908. This indicates that the minimum capital requirement variable and any other included variables in the model explain 69.08% of the variation in the net interest margin. The remaining variation is attributed to unobserved bank-specific effects. In other words, the findings reveal that while the model's explanatory variables can account for a significant portion (69.08%) of the changes in NIM, there are still other factors not included in the model that contribute to 30.9% of the variations in the net interest margin of the private commercial banks in Ethiopia. Furthermore, the ANOVA result shows an F-statistic of 28.92, which is significant at the 5% level of significance. This suggests that all the independent variables included in the model can jointly predict the net interest margin of the selected private commercial banks in Ethiopia. These statistical results provide valuable insights into the model's explanatory power and the relative importance of the variables in explaining the variations in the net interest margin. The findings highlight the need to consider both the observed and unobserved factors that may influence the profitability of private commercial banks in the Ethiopian context. Future research could explore the inclusion of additional variables or alternative modelling approaches to further enhance the understanding of the determinants of bank profitability in the country.

Policy Directions

The key policy directions recommended based on the findings are:

- *Maintain and Strengthen Minimum Capital Requirements:* The study found that the introduction of minimum capital requirements has had a significant and positive impact on the profitability of private commercial banks in Ethiopia. This suggests that the current policy of maintaining appropriate capital levels should be continued, as it helps to enhance the soundness and intermediation efficiency of the banking sector.
- *Prioritise Operational Efficiency and Cost Control:* The negative relationship between the ratio of operating costs to total income and bank profitability underscores the importance of banks focusing on improving their management efficiency and optimizing operating expenses. Policymakers should encourage and incentivize banks to adopt best practices in this regard.
- *Promote Income Diversification:* The positive impact of non-interest income on bank profitability indicates that banks should be encouraged to diversify their income sources beyond traditional interest-based activities. Policymakers could consider measures to support the development of fee-based services, e-banking and digital services, trading, and other non-lending operations.
- *Review Consolidation Policy:* The findings on the positive but insignificant relationship between market concentration and profitability suggest that the current policy of encouraging mergers and acquisitions in the banking sector may need to be re-evaluated. Policymakers should carefully consider the potential trade-offs between concentration and competition, and explore ways to foster a more vibrant and competitive banking sector.
- *Monitor Macroeconomic Conditions:* The significant impact of real GDP growth on bank profitability highlights the importance of considering macroeconomic factors in assessing the performance of the banking sector. Policymakers should closely monitor economic trends and their implications for

the financial stability and sustainability of private commercial banks in Ethiopia.

Overall, the study's findings provide valuable insights that can inform policy decisions aimed at enhancing the performance and resilience of the private commercial banking sector in Ethiopia. By implementing these policy directions, policymakers can contribute to the development of a stronger, more efficient, and more competitive banking industry that supports the growth and stability of the Ethiopian economy. The study recommends additional analysis to explore the potential moderating or mediating factors that could affect the liquidity-profitability nexus.

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