



Research Paper

Income Diversification, Credit Risk and Profitability of Commercial Banks in Ethiopia

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Abstract

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Understanding how income diversification affects credit risk-taking behaviour and profitability in commercial banks is important for stakeholders, including bank owners, managers, and regulators. This study therefore examined the impact of income diversification on credit risk-taking and profitability of commercial banks in Ethiopia. Additionally, it investigated how bank-specific, market and macroeconomic-related factors influence the diversification, risk-taking and profitability of these banks. The analysis was based on unbalanced panel data of 19 banks from 1997 to 2022. The empirical estimation relies on the two-step Generalized Method of Moments (GMM) technique. The results indicate that commercial banks in Ethiopia tend to enhance their profitability by assuming greater credit risk. The findings also indicate that diversifying income sources toward non-traditional activities has a significant profit enhancing effect for Ethiopian commercial banks. Income diversification was also found to have credit risk-reducing benefits, but the effect is statistically insignificant. The results of the study further suggest that bank-specific characteristics, such as bank size and capitalization, and macroeconomic conditions play important roles in determining income diversification, credit risk-taking and profitability of banks in Ethiopia. In conclusion, the study recommended promoting diversification into non-traditional businesses to enhance profitability and stability within Ethiopia's commercial banking system.

1. Introduction

A sound and stable financial system is the heart of every modern economy. In most developing countries like Ethiopia, the system is largely dominated by commercial banks, and promoting a healthy and robust banking system is a fundamental precondition to realizing rapid and sustainable economic growth and development (World Bank, 2002). Commercial banks are profit-driven diversified organizations. Their

profitability is crucial not only for their stay in the business but also for the safety and robustness of the entire banking sector (Bikker & Vervliet, 2017). Nevertheless, risk is an integral part of the banking business. As financial intermediaries, banks' profitability greatly depends on both their risk-taking behaviour and competency in managing risks. Banks may assume greater risk to increase their net interest margins (Le & Ngo, 2020). Higher lending rates, however, may

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increase the probability of loan defaults (Amidu & Wolfe, 2013; Borauzima & Muller, 2022). Thus, while risk-taking is fundamental to optimizing profit, excessive risk-taking may increase the probability of bank failure (Boamah et al., 2022). Particularly, in an economy without bank deposit insurance, a single bank failure could trigger bank runs; thereby, destabilizing the banking system and thus the economy as a whole. Therefore, it is essential to examine whether diversification into non-interest income sources enhances banks' profitability and reduces their credit risk-taking behaviour, which is the focus of this study.

It is generally supposed that commercial banks adopt an income diversification strategy to survive competitive pressure, enhance profit and minimize risk (Amidu & Wolfe, 2013; Asif & Akhter, 2019; Octavianus & Fachrudin, 2022). The existing theories, however, provide no conclusive predictions. On one hand, diversification into non-traditional businesses is expected to enhance banks' overall profit both by increasing revenue and creating cost savings advantages (Laeven & Levine, 2007; Sharma & Anand, 2018; Luu et al., 2019). On the other hand, such diversification can negatively affect banks' overall profitability if the associated costs, such as managerial and administrative costs, outweigh the benefits (Laeven & Levine, 2007; Luu et al., 2019). Moreover, the gain from non-traditional businesses may either reduce or increase banks' incentive to invest in risky lending activities (Khan et al., 2020; Borauzima & Muller, 2022).

Understanding the impact of income diversification on the credit risk-taking behaviour and profitability of commercial banks holds importance for stakeholders such as bank owners, managers, and regulators. The lack of definitive conclusions in the existing theories underscores the necessity of empirically establishing this information. Nonetheless,

consistent with the theoretical literature, previous empirical findings from various countries and regions also present mixed evidence. Some of these studies find that income diversification significantly boosts banks' profitability (Hamdi et al., 2017; Luu et al., 2019; Ferreira et al., 2019; Ashraf & Nazir, 2023) and decreases their inclination towards risk-taking (Lee et al., 2014; Bikker & Vervliet, 2017; Hamdi et al., 2017; Khan et al., 2020; Hunjra et al., 2020). In contrast, some other studies show evidence that income diversification could reduce profit (Duho et al., 2019; Boamah et al., 2022; Lopez-Penabad et al., 2022) and elevate risk appetite (Duho et al., 2019; Hunjra et al., 2020; Lopez-Penabad et al., 2022; Borauzima & Muller, 2022). The mixed findings of these previous studies, thus, make it impossible to directly apply their conclusions to the banking industry in other economies. The benefits of income diversification may vary across countries due to regulatory, economic, and technological differences. This emphasizes the need for country-specific information on the theme.

Furthermore, the existing literature posits a reverse causality that runs from risk and profitability to income diversification (Pennathur et al., 2012; Meng et al., 2017; Luu et al., 2019; Boamah et al., 2022). The causality may also work between risk and return (Le & Ngo, 2020). In addition to this, banks' income diversification, profitability and credit risk-taking behavior can be simultaneously determined by a host of factors pertaining to individual banks, market and macroeconomic conditions. However, regarding the direction and statistical strength of the effect of these factors, the existing empirical findings show some conflicting pictures (for example, Pennathur et al., 2012; Meng et al., 2017; Hamdi et al., 2017; Bikker & Vervliet, 2017; Luu et al., 2019; Ferreira et al., 2019; Duho et al., 2019; Duho & Onumah, 2019; Khan et al., 2020; Hunjra et al., 2020; Lopez-Penabad et al., 2022; Boamah et al., 2022; Ashraf & Nazir, 2023).

This study explores the impact of income diversification on credit risk-taking and profitability of commercial banks in Ethiopia. Additionally, the analysis examines the impact of bank-specific, market, and macroeconomic factors on income diversification, risk-taking incentives, and profitability of these banks. The topic is worth considering in the Ethiopian context for some reasons. First, the financial sector of the country is closed to foreign institutions, and thus all private commercial banks that operate in the country are owned domestically. Second, since 2009, unstable macroeconomic conditions and regulatory and policy constraints have been reducing the country's commercial banks, especially private banks' ability to generate profit from private loans (Alemu, 2016). This argument is also supported by a recent study by Getinet et al. (2024). Third, thus far, the banking industry of the country lacks a secondary capital market as well as deposit insurance. Despite this, a recent empirical work by Ayalew (2021) reveals a growing credit risk-taking tendency among privately owned commercial banks in the nation. Therefore, investigating the impact of income diversification on credit risk-taking and profitability of Ethiopian commercial banks is imperative as the findings can serve as valuable insights for formulating policies that promote a sound and stable banking system.

The contribution of this study to the economics of banking literature is twofold. First, it contributes to the growing literature by examining the impacts of income diversification on the credit risk-taking tendency and profitability of Ethiopian commercial banks. To the best of our knowledge, no prior effort has been made to fill the knowledge gap in the Ethiopian context. Although they are few, the existing empirical studies emphasized on technical and/or overall efficiency of banks (Alemu, 2016; Lema, 2017; Abdulahi et al., 2023; Agama et al., 2023; Getinet et al., 2024),

and determinants of private banks' profitability (Ayalew, 2021). Recently Borauzima and Muller (2022) investigated the effect of income diversification along with other bank-specific, market and macroeconomic factors on the risk-taking tendency of African banks; however, the aggregated nature of the data used in their study makes their finding difficult to provide insight for policy intervention. Second, this study contributes to the limited but expanding literature on the effect of bank-specific, market and macroeconomic factors on individual banks' income diversification strategy (Pennathur et al., 2012; Meng et al., 2017; Hamdi et al., 2017; Duho & Onumah, 2019) and credit risk-taking behaviour (Bikker & Vervliet, 2017; Khan et al., 2020; Borauzima & Muller, 2022; Boamah et al., 2022).

2. Method

2.1. Model Specification

2.1.1. Dependent and Independent Variables

2.1.1.1. Dependent Variables

We specified three models: the first model (Model I) investigated the impact of income diversification and other factors on bank profitability. The second model (Model II) examined the influence of income diversification and other factors on banks' credit risk-taking tendencies. The third model (Model III) analyzed the determinants of income diversification.

Model I

We measured the profitability of the i^{th} bank at time t using two indicators: (i) rate of return on asset (ROA_{it}) and (ii) net interest margin (NIM_{it}).

- (i) ROA_{it} is calculated as a ratio of net profit (after tax) to total assets. It measures the overall profitability of a bank as it accounts for operating income and operating expenses. It also indicates how well the bank is managed (Pennathur et al., 2012; Amidu &

Wolfe, 2013; Saleh & Afifa, 2020; Thakur & Arora, 2024).

- (ii) NIM_{it} is calculated as the ratio of net interest income to total interest-earning assets. It measures the profitability of the intermediary business. Larger NIM_{it} ratio may suggest more profitability of banks in the traditional intermediary business:-

Model II

As per Pennathur et al. (2012), Bikker and Vervliet (2017), Saleh and Afifa (2020), Ayalew (2021), and others, we measured credit risk-taking behaviour of the i^{th} bank at time t based on the ratio of loan loss provisions to gross loans (LLP_{it}). A higher LLP_{it} ratio implies a higher risk-taking (more risky loan portfolio). Larger LLP_{it} also represents a lower quality of the loan portfolio (larger NPLs). This is because a large proportion of NPLs translates into higher credit risk and therefore more credit loss provisions (Bikker & Vervliet, 2017).

Model III

Following some prior studies, such as Lee et al. (2014), Khan et al. (2020), Hunjra et al. (2020), Lopez-Penabad et al. (2022), Boamah et al. (2022) and others, we measured income diversification of the i^{th} bank at time t (Div_{it}) as a ratio of non-interest income (NII_{it}) to total income (TOI_{it}) of the bank.

$$Div_{it} = NII_{it}/TOI_{it}$$

Where i ($= 1, 2, \dots, N$) refers to the bank; t ($= 1, 2, \dots, T$) indicates the time; N refers to the number of banks, and T denotes the number of years.

2.1.1.2. Independent Variables

This paper focuses on investigating the impact of income diversification on banks' credit risk-taking and profitability. To capture the dynamic nature of the panel, we included one one-year lagged value of each dependent variable as independent variable. In addition to this, each dependent variable treated as independent variable in the other models. For example, following the conventional risk-return hypothesis, we included a proxy measure of credit risk-taking in the profit model (in Model I). Similarly, in Model III, we accounted for the effect of credit risk-taking behaviour and profitability on banks' income diversification decision (Pennathur et al., 2012; Luu et al., 2019; Boamah et al., 2022). In addition, we controlled two bank-specific variables (bank size and capitalization) and two macroeconomic variables (economic growth and inflation) in each model. We used natural logarithm of total assets as a proxy for bank size ($lnbs_{it}$). The ratio of equity to total assets is used as a proxy for bank capitalization (Fik_{it}). Economic growth is measured by the annual growth rate of real GDP (GDP_growth_t). Inflation rate (inf_t) is measured as the annual growth rate of the general price level. Following Hamdi et al. (2017), Lopez-Penabad et al. (2022) and others, we controlled the influence of the structure of the banking industry (degree of concentration) using the Herfindahl-Hirschman Index (HHI_t). Table 1 presents the definitions of variables used in the analysis.

Table 1: Definition and measurement of dependent and independent variables

Definition	Notation	Measurement
Return on Asset	<i>ROA</i>	The ratio of net profits to total assets
Net interest margin	<i>NIM</i>	The ratio of net interest income to interest-bearing assets
Loan loss provision	<i>LLP</i>	The ratio of loan loss reserve to total loans
Income diversification	<i>div</i>	The ratio of non-interest income to total income
Bank size	<i>lnbs</i>	Natural logarithm of total assets
Bank capital	<i>Fik</i>	The ratio of equity to total assets
Inflation	<i>inf</i>	Percentage of annual rate of general inflation
Economic growth	<i>GDP_growth</i>	Percentage of annual real GDP growth rate
Concentration ratio	<i>HHI</i>	The sum of the squares of each bank's market share in total banking assets.

2.1.2. Empirical Model Specification

Analogous to our statements above, we specified three separate models for income profitability (1), credit risk-taking (2), and diversification (3). The dynamic panel models are expressed as:

$$Y_{it} = \beta_0 + \beta_1 Y_{it-1} + \beta_2 LLP_{it} + \beta_3 Div_{it} + \gamma X_{it} + \vartheta Z_t + w_{it} \quad (1)$$

$$LLP_{it} = \mu_0 + \mu_1 LLP_{it-1} + \mu_2 Y_{it} + \mu_3 Div_{it} + \varphi X_{it} + \omega Z_t + u_{it} \quad (2)$$

$$Div_{it} = \alpha_0 + \alpha_1 Div_{it-1} + \alpha_2 Y_{it} + \alpha_3 LLP_{it} + \delta X_{it} + \theta Z_t + v_{it} \quad (3)$$

Where Y_{it} denotes profits (NIM_{it} and ROA_{it}) of bank i in year t ($i = 1, 2, \dots, N$; $t = 1, 2, \dots, T$), and Y_{it-1} is a vector of one period lagged values of bank profit; X_{it} is a vector of bank-specific exogenous covariates; Z_t is a vector of market and macroeconomic variables, and v_{it} , u_{it} and w_{it} are idiosyncratic errors. The α_0 , α_1 , α_3 , μ_0 , μ_1 , μ_3 , β_0 , β_1 , β_2 , β_3 and vector δ , θ , φ , ω , γ and ϑ are parameters to be estimated. β_1 , α_1 and

μ_1 capture the level of persistence of profits, risk and income diversification, respectively.

The empirical analysis of the study relies on a two-step Generalized Method of Moments (GMM) approach. We chose the GMM method over OLS because the application of the latter technique could produce estimates that suffer from endogeneity and unobserved heterogeneity biases. Other potential alternative estimation techniques are the standard panel models: fixed- and random-effects models; however, the application of these models on dynamic models that include lagged dependent variables as a covariate produces inconsistent estimates. Similarly, the exclusion of the lagged term may result in dynamic bias. One important advantage of the GMM approach over the standard instrumental variables (IV) approach is that it relies on internal instrumental variables (Luu et al., 2019).

Table 2: Summary Statistics

Variables	Observation	Mean	Sta. Dev.	Min	Max
<i>ROA</i>	316	0.028	0.019	-0.067	0.075
<i>NIM</i>	316	0.108	0.091	0.000	0.874
<i>LLP</i>	316	0.077	0.109	0.000	0.571
<i>Div</i>	316	0.360	0.136	0.006	0.767
<i>lnbs</i>	316	8.837	1.842	4.331	16.423
<i>Fik</i>	316	0.150	0.079	0.037	0.868
<i>inf</i>	26	14.872	12.597	-10.800	55.200
<i>GDP_growth</i>	26	8.356	3.077	-2.099	12.644
<i>HHI</i>	26	0.472	0.124	0.331	0.873

3. Results

3.1. Data and Descriptive Summary

The empirical analysis of this study relies on bank-level unbalanced panel data and macroeconomic data. The bank-level data comprised a total of 19 commercial banks, including the state-owned bank, Commercial Bank of Ethiopia (CBE)²- and 18 privately owned domestic banks. We excluded four newly established domestically owned private banks that operate only for a year, and the remaining banks in the data have a minimum of 5 years of operation. The data covered 26 years that span from 1997 to 2022. The unbalanced panel data contained a minimum of 3 banks in 1997 and a maximum of 19 banks in 2022³. All the bank-specific data were extracted from each of the bank's annual final audit reports, which were obtained from the National Bank of Ethiopia (NBE). The macroeconomic data is taken from the NBE's annual reports available on their web page as well as other documents issued by the Ethiopian government on the internet.

Table 2 presents the descriptive statistics of all variables used in the analysis. The mean value of *ROA* is found to be 0.028, but the ratio ranges from the minimum of -0.067 to the maximum of 0.075. The negative value of *ROA* suggests that, during the sample period, some banks registered negative overall profit. Similarly, the minimum value of *NIM* (0.00) reflects that, during the period covered by our dataset, some Ethiopian banks failed to generate positive net profit

margins from traditional businesses to cover operating costs. As for *LLP*, on average 0.08 (8%) of total loans were allocated to absorb (expected) credit losses; however, during the years covered by our data, the amount varied between the minimum of 0% and the maximum of 57%. Ethiopian commercial banks' traditional sources of revenue include interest income from loans and advances, treasury bills, government bonds, deposits with foreign banks, and other similar interest-earning assets. Non-interest income of the country's banks includes service charges and commissions, net gain on foreign currency transactions, net gain on equity investment in associates, automatic teller machine (ATM) fees, and other related income. As the descriptive statistics show, on average, noninterest income accounts for 36% of total operating income, whereas interest income accounts for the remaining (64%) of total operating income. However, the importance of noninterest income in total bank income varied over time; that is, with a minimum of 0.6% to a maximum of 77%. In addition to differences in ownership structure, there are also age and size differences among Ethiopian commercial banks. In fact, in the country, larger banks are relatively older than their smaller counterparts. CBE is the largest and the oldest bank in our dataset⁴. As far as the structure of the Ethiopian banking industry is concerned, the average value of *HHI* (0.47) suggests moderate concentration; however, the figure ranges from the minimum value of 0.33 to the maximum value of 0.87, suggesting some

² The government also owned two other banks in Ethiopia, namely Development Bank of Ethiopia (DBE) and Construction and Business Bank (CBB). We excluded them in this study because they have different goals and objectives than other commercial banks. Moreover, the DBE obtains its funds from other commercial banks, primarily from CBE, whereas the CBB ceased to operate few years before.

³ The 2022 final audit reports contain no information on CBE, so the bank-level data of the bank is missed for the year 2022.

⁴ A thorough discussion of our dataset and the characteristics of Ethiopian commercial banking industry are available in Getinet et al. (2024).

variation in the degree of concentration over time.

3.2. Empirical Analysis

3.2.1. Model Specification Tests and Estimation Strategies

We began our analysis by examining the data for the presence of a unit root problem. Since our panel dataset was unbalanced, we applied a Fisher-type ADF unit root test. For all variables, the test rejects the null hypothesis that all these panels contain unit roots. Moreover, we applied the Arellano-Bond autocorrelation (AB) test to check the presence of autocorrelation. The significant p-values in parentheses corresponding to the first and second-order AB test statistics suggest that the null hypothesis of no autocorrelation cannot be rejected. We estimated all three Equations using the second lag of the dependent variable as an instrument. However, in our estimation of Equation (2), we

also used the first and second lag values of bank-specific variables as instruments. Columns (2) to (5) of Table 3 reported the 2-step GMM estimates of covariates of Equation (1), (2) and (3) respectively. To check the robustness of our results, we applied the 2-step GMM method and re-estimated Equation (1), (2) and (3) in static form, and the results remain qualitatively, in terms of signs and significance levels, the same for most variables⁵. However, the Hansen test statistics rejected the validity of our instruments in static specifications. The significant p-values in parentheses corresponding to Hansen J-statistics confirmed the validity of our instruments in dynamic specifications, suggesting these models are well specified. Moreover, the highly significant coefficients of the lagged dependent variables validated the dynamic character of the model specification. Therefore, the rest of the discussion is based on 2-step GMM estimates of the dynamic models.

⁵ We reported our static model estimation results at the appendix part.

Table 3: Two-step GMM estimates

Variables	ROA_{it}	NIM_{it}	LLP_{it}	Div_{it}
ROA_{it-1}	0.4655*** (0.0612)			
NIM_{it-1}		0.4598*** (0.0727)		
LLP_{it-1}			0.7376*** (0.0326)	
Div_{it-1}				0.5112*** (0.0650)
ROA_{it}			-1.0488*** (0.2834)	2.0913*** (0.6700)
NIM_{it}			0.1798*** (0.0268)	-0.3542*** (0.0616)
LLP_{it}	-0.0016 (0.0109)	0.1795*** (0.0582)		0.0407 (0.0693)
Div_{it}	0.0316*** (0.0064)	-0.2418*** (0.0423)	-0.0158 (0.0216)	
Fik_{it}	0.0413** (0.0168)	0.2024* (0.1172)	-0.0570* (0.0321)	-0.4591*** (0.1126)
$lnbs_{it}$	0.0019** (0.0009)	-0.0041 (0.0050)	-0.0036* (0.0020)	-0.0359*** (0.0083)
Inf_t	0.0001 (0.0000)	0.0012** (0.0005)	0.0000 (0.0002)	0.0006** (0.0003)
GDP_growth_t	0.0010*** (0.0002)	0.0038*** (0.0009)	-0.0012** (0.0005)	0.0020 (0.0017)
HHI_t	0.0188 (0.0137)	0.0832 (0.0732)	0.0492** (0.0233)	-0.1541 (0.1116)
Constant	-0.0342** (0.0165)	0.0533 (0.0969)	0.0655** (0.0294)	0.5651*** (0.1246)
$AB(1)(p - value)$	-1.6959 (0.0899)	-1.3875 (0.1653)	-1.834 (0.0667)	-0.5284 (0.5972)
$AB(2)(p - value)$	-0.62721 (0.5305)	0.07492 (0.9403)	-0.0551 (0.9561)	-0.3456 (0.7296)
Hansen test ($p - value$)	2.130 (0.1445)	2.200 (0.3328)	8.740 (0.4616)	0.227 (0.6340)
No. of Observation	260	260	260	260

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4. Discussion

4.1. Profitability

Columns (2) and (3) of Table 3 present the 2-step GMM estimates of Equation (1) for two measures of bank profit- ROA and NIM. The coefficient of ROA_{it-1} and the coefficient of NIM_{it-1} are appeared with the approximate value of 0.47 and 0.46, respectively. This means that the degree of competition in the Ethiopian banking industry is moderate, and hence banks' profits are moderately persistent. Credit risk-taking appeared to impair Ethiopian banks' overall profitability (ROA) but the coefficient was not statistically significant, as shown in Column (2). Moreover, consistent with the conventional risk-return hypothesis and also in support of prior empirical shreds of evidence (Bikker & Vervliet, 2017, Le & Ngo, 2020; Ayalew, 2021; Lopez-Penabad et al., 2022; Boamah et al., 2022), we found credit risk-taking to enhance NIM, as shown by a positive and significant coefficient of LLP in Column (3).

As far as the effect of income diversification on banks' overall profitability is concerned, we found that an increase in the share of non-interest income in total income boosts Ethiopian banks' overall profitability, as measured by ROA, as a positive and statistically significant coefficient of Div in Column (2) shows. This may suggest that the benefits of diversifying business into non-traditional activities outweigh the costs in the context of the Ethiopian commercial banking industry. This suggests that Ethiopian commercial banks may benefit from economies of scope by diversifying their income into non-traditional businesses. This is in agreement with the findings of some previous studies in different economies, such as Bikker and Vervliet (2017), Hamdi et al. (2017), Sharma and Anand (2018), and Luu et al. (2019); however, it contradicts with the findings of Duho et al. (2019) and Boamah et al. (2022). However, as for the effect of diversification on NIM, the result appears negative and highly significant, as shown in Column (3). Together with the negative but

insignificant effect of income diversification on credit risk-taking (see in Column (4)), we can conclude that an increase in non-interest income reduces the NIM of Ethiopian banks by inducing them to invest in the traditional lending business that combines lower risk and lower return. This is in support of the argument in the literature (Demirgüç-Kunt et al., 2004; Pennathur et al., 2012), and also in line with the findings of some previous studies, such as Bikker and Vervliet (2017) and Lopez-Penabad et al. (2022).

Regarding other bank-specific variables, our findings indicate that strong capitalization enhances the profitability of Ethiopian commercial banks, as evidenced by the positive and statistically significant coefficients of the capital-to-asset ratio in Columns (2) and (3). This is in support of the expectation that better capitalization increases banks' ability to charge higher lending rates and/or pay lower deposit rates (Demirgüç-Kunt et al., 2004; Lopez-Penabad et al., 2022). Our results also align with the findings of several prior studies, including Bikker and Vervliet (2017), Hamdi et al. (2017), Sharma and Anand (2018), Luu et al. (2019), and Saleh and Afifa (2020), while contradicting the findings of Le and Ngo (2020). As for bank size, we found the effect on the ROA of Ethiopian banks is positive and highly significant. The effect of bank size on NIM is, however, found to be negative but insignificant. As discussed in succeeding sections, the effect of size on income diversification and credit risk-taking behavior of the country's banks is negative and highly significant (see Columns (4) and (5)). Given this, our result of higher ROA but lower NIM associated with bank size may suggest the fact that as Ethiopian banks became larger and older they tended to enjoy better cost advantages that arise from economies of scale and economies of learning (experience). Compared with the findings of some prior studies from other countries, our result regarding the effect of size on ROA is in line with Bikker and Vervliet (2017) and Luu et al. (2019) but contradicts with

Hamdi et al. (2017), Saleh and Afifa (2020), and Lopez-Penabad et al. (2022). Our findings also somehow contradict the findings of a recent study by Ayalew (2021) in Ethiopia. However, unlike ours, his study focused on privately owned commercial banks.

Regarding the impact of macroeconomic variables, both growth in real GDP and inflation appear to be drivers of Ethiopian banks' profitability. However, the effect of inflation on ROA was found to be statistically insignificant. The profit-enhancing effect of economic growth supports the findings of Bikker and Vervliet (2017), Le and Ngo (2020), Boamah et al. (2022), and Lopez-Penabad et al. (2022). The positive and significant effect of the high inflation rate on NIM is in agreement with the findings of previous studies (Bikker & Vervliet, 2017; Boamah et al., 2022; Lopez-Penabad et al., 2022).

4.2. Credit Risk-taking

The 2-step GMM estimates of Equation (2) are reported in Column (4). The coefficient of LLP_{it-1} is positive and significant, suggesting that risk is persistent over time. This is consistent with the finding of Borauzima and Muller (2022) in African banks. The effect of bank profitability measured by ROA appears to have a negative and significant association with LLP, suggesting that well-managed Ethiopian banks tend to take less risk. In contrast to this, the coefficient of *NIM* appears to be positive and statistically significant, consistent with the finding of Boamah et al. (2022) and suggesting that profitability of the traditional intermediary businesses may induce banks to take higher credit risk. Moreover, the effect of income diversification is found to be negative, but statistically insignificant.

Regarding the effect of other bank-specific factors, our result shows that better-capitalized banks in Ethiopia have a lower incentive to take credit risk, as the negative and statistically significant coefficient of *Fik* in Column (4)

shows. Financial capital serves as a cushion against portfolio losses; hence, as the level of capitalization increases, the amount of funds that Ethiopian banks allocate to absorb (expected) loan losses tends to decline. This is consistent with the argument that banks with better capital position could achieve higher profit without taking excessive credit risk (Demirgüç-Kunt et al., 2004; Bikker & Vervliet, 2017; Lopez-Penabad et al., 2022). The result is in agreement with Bikker and Vervliet (2017). Similarly, we found that the credit risk-taking incentive of the Ethiopian commercial banks tends to decline as they grow in size. The result substantiates our earlier argument related to economies of scale and economies of experience (learning) advantages of large banks in Ethiopia; this is, as banks grow larger and become older, they may find the traditional banking activities to be less risky and more profitable. Our result is in line with the finding of Borauzima and Muller (2022) but contradicts the result of Bikker and Vervliet (2017).

As for the effect of macroeconomic conditions, we found evidence that economic growth to have a negative and statistically significant influence on Ethiopian commercial banks credit risk-taking, which is consistent with the findings of prior studies, such as Hunjra et al. (2020) and Lopez-Penabad et al. (2022), but contradict with some others, such as Bikker and Vervliet (2017) and Boamah et al. (2022). The effect of inflation is found to be positive, but insignificant.

4.3. Income Diversification

As shown in Column (5) of Table 3, Ethiopian commercial banks' income diversification strategy is determined by both bank-specific and macroeconomic conditions. The coefficient of the lagged income diversification variable is positive and statistically significant, and it takes a value of approximately 0.51. This means that non-interest income is moderately persistent in the Ethiopian banking industry. Commercial banks in Ethiopia mainly engaged in retail-

oriented banking business (Ayalew, 2021). Based on this and Luu et al. (2019), we conclude that non-interest income generating activities are relatively low-risk activities and could serve as moderately stable sources of bank revenue in Ethiopia.

Among bank-specific variables, ROA was found to have a positive and statistically significant influence on Ethiopian banks' income diversification. This is in line with Thakur and Arora (2024). Contrary to this, *NIM*, capitalization and bank size appear to have a negative and statistically significant influence on the income diversification strategy of commercial banks in Ethiopia. A negative coefficient of *NIM* suggests that as the profitability of the traditional intermediary businesses increases, Ethiopian banks' incentive to generate revenue from non-traditional businesses tends to decrease. The result is somehow comparable with Meng et al. (2017) who found a similar result in the case of Chinese banks; however, they used interest spread as a proxy measure of the profitability of the traditional business, while we employed *NIM*. Ammar and Boughrara (2019) also found similar result among non-GCC banks.

The negative and significant coefficient of *Fik* implies that as Ethiopian banks become well-capitalized, their incentive to generate non-interest income tends to decline. Lower capital position might be risky, and hence it may induce banks to enhance their solvency by generating profit or revenues from non-traditional business. Higher capitalization, on the other hand, can lower the chance of insolvency and lower the cost of external funds, and thus it may enhance banks' profitability from traditional lending business (Pennathur et al., 2012). The result is in line with the findings of some previous studies in different countries, such as Pennathur et al. (2012) and Hamdi et al. (2017) while it contradicts Meng et al. (2017).

Moreover, the negative and highly significant coefficient of bank size suggests that the share of non-interest income in total income tends to decline as Ethiopian banks become larger. When banks are new to the market, they are likely to have a less competitive advantage in traditional lending businesses than larger and older banks; therefore, high concentration on the line of the businesses could leave them with underutilized inputs. If the competition stability hypothesis is true (Asif & Akhter, 2019), our results suggest that when Ethiopian banks were small and new to the market, they had a greater incentive to generate non-interest income. By expanding into non-traditional activities, these banks could better utilize existing resources that might have otherwise remained underutilized. Generally, together with the effect of size on overall profitability and credit risk-taking behavior of Ethiopian banks, our result here leads us to conclude that as the country's commercial banks become larger and older, they tend to focus more on the traditional businesses through the substitution of competitive advantage of economies scale and economies of learning (experience) for economies of scope. Our result is consistent with the findings of Hamdi et al. (2017) and Ammar and Boughrara (2019), while it contradicts the findings of Meng et al. (2017) and Duho and Onumah (2019).

As far as the effects of macroeconomic conditions are concerned, we found Ethiopian banks' income diversification strategy derived from the high inflation rate and economic growth; however, the coefficient of economic growth appears to be statistically insignificant. A strong positive influence of high inflation on income diversification is consistent with the findings of Boamah et al. (2022) and Thakur and Arora (2024).

5. Conclusions

This study examined the impact of income diversification on risk-taking and profitability of commercial banks in Ethiopia. Additionally, it

investigated how bank-specific and macroeconomic factors influence the diversification, risk-taking and profitability of these banks. The analysis was based on unbalanced panel data of 19 banks over the period of 1997-2022. The empirical estimation relies on a two-step Generalized Method of Moments (GMM) technique.

Empirical results indicate that commercial banks in Ethiopia tend to enhance their profit by taking more credit risk. The results also show that diversification toward non-interest income is stronger in enhancing Ethiopian commercial banks' overall profitability (as measured by ROA) than reducing their credit risk-taking behaviour. We also found evidence that Ethiopian commercial banks with larger sizes, as well as banks with better capitalization, have a comparative advantage in the traditional lending businesses, whereas banks with smaller asset sizes as well as banks with lower capitalization tend to survive the competitive pressure by diversifying their income into non-traditional businesses. Moreover, our findings indicate that economic growth improves banks' profitability and reduces their credit risk exposure. We also found that a higher inflation rate influences Ethiopian banks to diversify into non-traditional businesses.

Based on the findings, we draw the following policy implications and future research

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directions. First, promoting income diversification is crucial to ensure a safe and sound commercial banking system in Ethiopia. Second, the direction and strength of bank-specific factors are directly related to managerial quality and ability; therefore, the result of this study can be valuable information to bank owners to adopt a strategy that improves managerial quality and/or develops more efficient incentive schemes. Third, ensuring a favourable macroeconomic environment could exert a profound effect on fostering stable growth of the banking system.

The findings of this study, however, are not free from some limitations. First, to conserve space, we did not consider non-uniform benefits of income diversification across banks with different size and ownership forms. Thus, future researches that address this limitation could provide more complete information that can aid in designing policies that improve the profitability and competitiveness of commercial banks in Ethiopia. Second, future research that applies better measure(s) of market power could improve our understanding of the issue in the Ethiopian context.

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Appendix

Variables	ROA_{it}	NIM_{it}	LLP_{it}	Div_{it}
ROA_{it}			-1.5682* (0.8764)	3.8423*** (0.5198)
NIM_{it}			0.3387* (0.1832)	-0.7175*** (0.1500)
LLP_{it}	0.0047 (0.0127)	0.3176*** (0.0669)		0.0475 (0.0745)
Div_{it}	0.0457*** (0.0124)	-0.3761*** (0.0528)	-0.0220 (0.0861)	
Fik_{it}	0.0865*** (0.0182)	0.0980 (0.1291)	-0.4940*** (0.1722)	-0.2688* (0.1372)
$lnbs_{it}$	0.0042** (0.0019)	-0.0221*** (0.0054)	-0.0184** (0.0080)	-0.0678*** (0.0070)
Inf_t	0.0001 (0.0000)	0.0012** (0.0005)	0.0001 (0.0003)	0.0010** (0.0004)
GDP_growth_t	0.0012*** (0.0002)	0.0034*** (0.0012)	0.0006 (0.0013)	0.0053*** (0.0019)
HHI_t	0.0343 (0.0242)	-0.1267** (0.0642)	0.0834 (0.0776)	-0.3148*** (0.1210)
Constant	-0.0609* (0.0323)	0.4138*** (0.0810)	0.2690** (0.1192)	1.0344*** (0.1079)
Hansen test ($p - value$)	9.654 (0.0080)	9.923 (0.0192)	4.463 (0.1073)	10.490 (0.0053)
No. of Observation	260	260	260	260

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$