

Revenue Diversification, Financial Performance, and Risk of Banks

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Abstract

This study examines the effect of revenue diversification on the financial performance and risk of the Nepali banking sector using annual data of twenty-two commercial banks listed on the Nepal Stock Exchange for the study period from 2004/2005 to 2014/2015. To deal with potential endogeneity caused by reverse causality, the study employs the instrumental variable method with two stages of least squares. The analysis concluded that revenue diversification has a positive effect on the financial performance of banks even after controlling the bank's specific and macroeconomic variables. Likewise, the study also revealed that an increase in revenue diversification of banks leads to an increase in Z score, which indicates lower risk since a higher Z score signifies lower risk for banks. Banks can improve their financial performance and value to investors and reduce their risk by diversifying their revenue into various sources. These results have significant strategic implications for bank managers, regulators, and supervisors who share a common interest in boosting banks' financial performance and stability.

Keywords: Revenue Diversification, Financial Performance, Insolvency Risk, Instrumental Variable Method, Adjusted Herfindahl-Hirschman Index

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1. Introduction

Involvement in non-traditional businesses may, in theory, reduce a bank's risk and boost its financial performance. While many non-financial firms around the world have been striving for corporate business focus, many financial firms, especially banks, have been heading in the opposite direction and have instead increased diversification (Elas, Hackethal, and Holzhauser, 2010). Should banks be diversified across various activities such as securities underwriting, insurance, brokerage, and fiduciary services? Specifically, is diversification or focus the way to improve financial performance and reduce the risk of a bank? If diversification is beneficial to the banks, it should be reflected in their financial performance. This question of focus versus diversification in the banking industry has gained importance for bank managers, shareholders, regulators, and financial economists.

A rapidly changing financial environment, increased competition, regulatory pressure (capital requirements), and the volatility of interest-based income in the banking system have pushed the banks to think about non-traditional ways of income generation (Ismail, 2014). In addition, interest income is more sensitive to interest rate movements, and economic downturns impose a 5% interest rate spread. Furthermore, competition in the banking sector could result in a possible reduction in total earnings and, therefore, banks would have to find alternative sources of income. This has led banks to expand their activities and to develop new lines of business in addition to their traditional activities. Likewise, with the opening up of the economy and due to the increased competition brought about by financial liberalization, banks have started to diversify their activities, and, as such, the non-interest income of banks has acquired greater significance in Nepal. Entry deregulation and the resulting intensified competition may leave banks with no choice but to engage in risk-taking activities in the fight for market share. Further, there is no regulatory requirement for capital for many fee-based activities. This scenario has encouraged banks to diversify into new activities that bring higher returns.

This study contributes to this growing body of literature by examining the impact of revenue diversification on financial performance and risk using a panel dataset of 22 commercial banks listed on the Nepal Stock Exchange. The current study provides empirical evidence concerning revenue diversification to help enhance the financial performance of banks. Hence, banks should try to diversify their income sources through various nontraditional activities to enhance their profitability. The inclusion of such activities may enhance the safety and soundness of the banking system. Further, it shows that diversification of the revenue of a bank across various sources helps the bank reduce its risk. It provides further important insight to bank managers, investors in bank stocks, and bank regulators about banks' diversification versus focus strategy.

To sum up, whether revenue diversification of a bank helps improve the financial performance, enhances the bank's profitability, and reduces the bank's risk is the main issue to be investigated. In this study, whether or not revenue diversification of a bank helps enhance its financial performance, i.e. enhances profitability and reduces risk, has been studied.

2. Literature Review

The focus versus diversification literature is well-established in corporate finance, with the consensus being that diversified firms tend to perform worse than focused firms (e.g., Lang and Stulz, 1994; Berger and Ofek, 1995; Lamont and Polk, 2000). They argued that firms should focus on a single line of business to maximize the advantage of management's expertise and reduce agency problems. However, the conclusions in the general corporate finance literature may or may not apply to the banking sector because banks are different from other firms. Banks, by their very nature, are designed to diversify (Winton, 1999; Acharya, Husan, and Saunders, 2006).

Empirical studies such as Stiroh (2004, 2006); Sanya and Wolfe (2011); and Stiroh and Rumble (2006) documented the evidence that diversifying revenue in non-traditional activities improves a bank's financial performance in line with the portfolio theory developed by Markowitz (1952). Banks can benefit from revenue diversification if they diversify into specific types of non-interest income-generating activities (Nisar *et al.*, 2018). If banks were allowed to add some non-banking financial products to their traditional mix of banking services, the resulting portfolio diversification effects could potentially increase banks' expected returns without increasing their riskiness or, equivalently, reduce banks' riskiness without reducing their expected returns. It is the opposite of keeping all the eggs in the same basket. Thus, *ceteris paribus*, an increase in income from sources other than interest will enhance the financial performance and reduce the risk of banks.

The trend toward diversification of bank income sources provides banks with additional sources of revenue. However, expanding fee-based services can require substantial additions to fixed costs, which increases the operational leverage of the bank. Once a lending relationship is established, the only cost of an additional loan is the interest expense, while the same does not apply to non-interest income, where additional staff may be required. Likewise, corporate finance theory argues that financial institutions should focus on a single line of business to maximize the management's expertise and reduce agency problems, leaving investors to diversify on their own (Berger and Ofek, 1996). Studies like those by DeYong and Roland (2001), Staikouras and Wood (2003), Stiroh (2004), and Acharya *et al.* (2006) documented evidence against the diversification of banks. The results also supported the evidence that incomes generated from non-traditional activities are profitable but risky. The greater reliance on non-traditional activities (non-interest income) has been associated with higher volatility of

bank income and higher risk, but not higher returns. Further, diversification negatively impacts profitability, and the greater the diversification, the higher the risk for commercial banks. However, the more diversified listed banks are the greater the bank's stability (Ngugyen, 2019). Thus, although diversification plays an important role in achieving desirable efficiency for a bank, the costs of diversification might be associated with higher income volatility, implying higher risk.

3. Research Method

The study aimed to analyze the effect of revenue diversification on both financial performance and risk by using an annual dataset of 22 listed Nepali commercial banks by NEPSE out of 28 commercial banks at the end of 2016 using annual data. Banks with less than five years of data, banks with negative book equity, and banks undergoing mergers and acquisitions are not included in the sample. Although there are a large number of other financial institutions (development banks, finance companies, saving and credit institutions/cooperatives) that provide banking services, the sample used in this study rightly represents the Nepali banking industry since the sampled banks represent 78.5 percent of the commercial banks' total assets (Nepal Rastra Bank, 2015).

The study used robust standard error to generate unbiased standard errors that corrected for heteroscedasticity and autocorrelation. The important property of robust standard error is that heteroscedasticity and/or autocorrelation do not need to be specified (Croux, Dhanae, and Hoorelbeke, 2004). Firstly, a pooled cross-sectional analysis is undertaken, and secondly, an instrumental variable method is employed to deal with endogeneity.

3.1 Econometric Model Specification

Model 1: Revenue Diversification and financial performance of banks.

$$\pi_{it} = \beta_0 + \beta_1 D_{it} + \sum_{j=1}^5 \lambda_j A_{itj} + \sum_{k=1}^2 \gamma_k B_{itk} + \varepsilon_{it} \quad (1)$$

Model 2: Revenue Diversification and Bank Risk.

$$Y_{it} = \beta_0 + \beta_1 D_{it} + \sum_{j=1}^5 \lambda_j A_{itj} + \sum_{k=1}^2 \gamma_k B_{itk} + \varepsilon_{it} \quad (2)$$

Where π_{it} is market-based financial performance as measured by Tobin Q and accounting-based financial performance by Return on Asset (ROA). This study used Tobin Q as the proxy for the market-based financial performance of banks as in the studies by Baele *et al.* (2007) and Laeven and Levine (2007). Return on Assets is an important measurement to determine the effectiveness of banks (Acharya *et al.*, 2006; De Young and Rice, 2004; Stiroh, 2004; Busch and Kick, 2009). $Y_{i,t}$ is bank risk represented by insolvency risk. In line with Stiroh (2004) and Laeven and Levine (2009), the study used an insolvency risk computed in terms of the Z-score

is the measure of bank risk. α , β , and γ are the parameters to be estimated. $D_{i,t}$ is revenue diversification of banks measured by the Adjusted Herfindahl-Hirschman Index (HHI). $A_{i,t}$ is a matrix of bank-specific variables used to capture the effect of bank-specific characteristics on financial performance for each bank i during the year t . $B_{i,t}$ is a matrix of macroeconomics used to capture the effect of macroeconomic variables on financial performance for each bank i during the year t . $\varepsilon_{i,t}$ is the residual value.

3.2 Herfindahl-Hirschman Index

Herfindahl-Hirschman Index is defined as the total square of the sales share of each product of the firm. A Herfindahl index close to its minimum means that banks are highly diversified across sectors (Schertler *et al.* 2006). The study used an adjusted Herfindahl-Hirschman index following Acharya *et al.* (2006), Stiroh and Rumble (2003), and Stiroh (2004) to measure revenue diversification. The equation given below shows how the diversification index is constructed.

$$D = 1 - \left\{ \left(\frac{\text{INT}}{\text{TOR}} \right)^2 + \left(\frac{\text{NII}}{\text{TOR}} \right)^2 \right\}$$

Where D is diversification index,

INT is interest income,

NII is non-interest income,

TOR is total revenue which is the sum of interest income and non-interest income.

A higher value of D indicates greater diversification. Revenue diversification is at its lowest point of (0) when gross revenue comes from a single source (complete concentration), and it is at its highest point (0.5) when net interest income plus non-interest income equals (complete diversification).

Table 1: A summary Variable Description

Variables	Description	Symbol	Hypothesized sign		
			Financial performance	Risk	
Dependent	Financial Performance	Return on Asset $\frac{\text{Net income}}{\text{Total assets}}$	ROA		
		Tobin Q $\frac{\text{Market value} + \text{Total liabilities}}{\text{Total assets}}$	Tobin Q		
	Risk	Insolvency risk $\frac{\text{ROA} + \text{E/A}}{\sigma}$	Z		
	Variables of interest	Revenue Diversification $1 - \left\{ \left(\frac{\text{INT}}{\text{TOR}} \right)^2 + \left(\frac{\text{NII}}{\text{TOR}} \right)^2 \right\}$	D	+/-	-
Independent	Internal variables	Size Natural logarithm of Total asset	Lnsiz	+	-
		Bank capitalization $\frac{\text{Total equity}}{\text{Total assets}}$	E/A	-	-
		Operational efficiency $\frac{\text{Cost}}{\text{Income}}$	C/A	-	+/-
		Managerial efficiency $\frac{\text{Operating cost}}{\text{Total assets}}$	O/TA	-	+
		Loan quality $\frac{\text{Nonperforming Loan}}{\text{Total loan}}$	NPL	-	+
	Macroeconomic variables	Economic growth Inflation CPI growth	GDPG INF	+	- +/-

3.3 Econometric Tools

3.3.1 Endogeneity and Endogenous Variable

The error term represents the collective unobserved effects of numerous omitted variables, simultaneity, as well as measurement error (Wooldridge, 2002). To ensure that parameter estimates are consistent, the error has mean zero i.e. $E(u|x) = 0$, and is uncorrelated with the explanatory variables i.e. $\text{Cov}(u, x) = 0$. If at least one explanatory variable say X_k is determined partly as the function of the dependent variable, then X_k and u are generally correlated (Wooldridge, 2002). The explanatory variable, i.e. revenue diversification as measured by adjusted HHI in the model, is influenced partly by the financial performance and risk of the bank. This means that the banks' financial performance, risk, and revenue diversification can all have an impact on one another. This simultaneity causes endogeneity. In such circumstances, observation does not necessarily mean that diversification influences profitability and risk;

rather, revenue diversification is correlated with the error terms in the regression model. Hence, the OLS estimator is inconsistent and biased. In this situation, the OLS estimator cannot be given a causal interpretation. To mitigate this problem, revenue diversification should be treated as an endogenous variable. The study applied the two-stage least squares (2SLS) estimator.

3.3.2 Instrumental Variable (IV) and Two-Stage Least Square (2sls) Method

One of the reliable methods to deal with endogenous variables is the Instrumental Variable (IV) method. To solve the endogeneity problem, the study adopted an instrumental variable approach. The instrumental variable method allows consistent estimation when the explanatory variable is correlated with the error terms in a regression (Wooldridge, 2003).

The two-stage least-squares (2SLS) method has been used to estimate the coefficients in the regression model. This method was employed to consider the endogeneity problem caused by omitted variables, bias measurement errors, and simultaneity that may arise in a regression model. The idea is to find a factor known as an instrumental variable that determines the revenue diversification but does not correlate with the error term. An instrumental variable must be correlated with the endogenous variables, but cannot be correlated with the error term in the model (Wooldridge, 2003).

In the IV approach, a first-stage regression is estimated for revenue diversification from variables that are correlated with it but not with the error term. Then, the observed values are replaced by their predicted values in the regression equation.

Since joint venture banks have a direct relationship with the international bank, they have a competitive advantage about technology advancement and its related operational efficiencies over the local bank. Hence, they are more likely to engage in nontraditional activities relative to their local counterparts. Joint venture banks are distinguished from local banks by the nature of their investment. Joint venture banks are banks that have been established in collaboration with foreign banks. Moreover, the correlation between revenue diversification and ownership is highly correlated, i.e., $r = 0.5158$ and significant (P-value = 0.000). Hence, the study has identified the ownership pattern as an instrument for revenue diversification. The 2SLS method has been used where the following instrumental variable regression is run at the first stage:

$$D_{it} = \alpha_0 + \alpha_1 OWN_{it} + \delta \quad (3)$$

OWN_{it} is ownership that takes 1 joint venture bank otherwise 0.

Then, the fitted value is used in the equation for regression analysis.

3.3.3 Weak Instruments

Weak instruments have a low correlation with the endogenous regressor after controlling for the exogenous regressors. They are called "weak instruments." IV estimation with weak instruments has poor statistical properties and may perform even worse than OLS (Stock, Wright, and Yogo, 2002). The relevance of the instruments was tested in the first-stage regression. As a rule of thumb, the F-statistic in the first stage regressions has to be greater than 10. Similarly, the instrument has to have a significant effect on endogenous variables.

4. Empirical Results

4.1 Descriptive Statistics

Table 2 summarizes the descriptive statistics of variables used in this study during the period 2004/2006 through 2014/2015. The number of observations is 210 firm years for accounting data during the study period. Based on the results of descriptive statistics as per Table 2, Return on Assets (ROA), which measures the accounting-based financial performance of banks, the first row shows the mean value of 1.6 percent, ranging between 4.39 percent and -6.06 percent during the study period, and the standard deviation is 0.98 percent. On the other hand, Tobin Q represents the mean value of 1.25 and the maximum and minimum values of 4.22 and 0.17, respectively, whereas the standard deviation is 0.40. Considering the figures for measures of risk, the mean Z score is 17.90. Adjusted HHI, denoted by D, suggests diversification of bank revenue towards non-interest-generating activities. It points out that the average is 0.23 while the maximum and minimum are 0.44 and 0.08, respectively, with a standard deviation of 0.08. The next is the natural logarithm of size. The average value is 10.20, with a maximum value of 11.73 and a minimum of 8.07, and the standard deviation is 0.73. The mean value is 8.07 and the standard deviation is 0.73. For E/A, C/I, and O/TA, the mean values are 8.07 percent, 81.91 percent, and 5.97 percent, respectively. Similarly, the standard deviations in number are 3.07, 14.28, and 2.58, respectively. The mean value for NPL is 2.3 percent, with a standard deviation of 3.56. Finally, the macroeconomic variables GDPG and INF were assigned to the second and final rows, respectively. GDPG and INF averages are 4.257 and 8.59 percent, respectively. The standard deviations are 0.78 and 2.04 respectively.

Table 2: Descriptive Statistics

Variables	N	Mean	Maximum	Minimum	Standard deviation
Dependent variables					
ROA	210	1.608	4.393	-6.063	0.983
Tobin Q	210	1.247	4.228	0.171	0.403
Z Score	210	17.190	56.835	0.788	9.752
Independent variables					
D	210	0.233	0.439	0.078	0.081
Lnsiz	210	10.203	11.734	8.065	0.726
E/A	210	8.077	21.896	1.299	3.069
C/I	210	81.915	189.631	45.711	14.277
O/TA	210	5.965	16.949	0.314	2.576
NPL	210	2.301	36.200	0.000	3.556
GDPG	210	4.257	5.800	3.200	0.795
INF	210	8.586	12.600	4.200	2.041

4.2 Correlation Analysis

Table 3 shows the correlation coefficients of the variables considered for the study. All measures of financial performance have a significant positive correlation with the revenue diversification of banks. This positive relationship indicates that the financial performance of banks improves with the increment in revenue diversification. Likewise, bank risk as measured by the Z score has a significant positive correlation with the revenue diversification of banks, indicating that higher revenue diversification leads to a higher Z score, which means lower bank risk. ROA has a positive correlation with equity to assets, revenue diversification, and size and a negative correlation with cost to income, operating expenses to total assets, and both macroeconomic variables. Tobin Q is found to be positively correlated with revenue diversification, GDPG, and size while being negatively correlated with equity to assets, the cost to income, operating expenses to total assets, and INF.

Table 3: Correlation Matrix

	ROA	Tobin Q	Z	E/A	C/I	O/TA	D	Lnsiz	NPL	INF	GDPG
ROA	1										
Tobin Q	0.400 0.000	1									
Z	0.194 0.004	0.090 0.193	1								
E/A	0.014 0.839	-0.125 0.069	0.239 0.000	1							
C/I	-0.736 0.000	-0.382 0.003	-0.088 0.202	0.283 0.000	1						
O/TA	-0.249 0.000	-0.198 0.004	0.023 0.736	0.426 0.000	0.539 0.000	1					
D	0.461 0.000	0.428 0.000	0.208 0.002	-0.306 0.000	-0.447 0.000	-0.403 0.000	1				
Lnsiz	0.157 0.022	0.050 0.465	0.086 0.214	-0.330 0.000	-0.072 0.298	0.060 0.384	0.329 0.000	1			
NPL	-0.242 0.000	-0.151 0.028	-0.151 0.028	0.051 0.459	0.466 0.000	0.328 0.000	0.027 0.692	-0.022 0.743	1		
INF	-0.001 0.979	-0.028 0.686	-0.063 0.359	0.075 0.274	0.059 0.393	0.319 0.000	-0.111 0.108	0.188 0.006	-0.067 0.328	1	
GDPG	-0.068 0.323	0.136 0.048	-0.035 0.612	0.581 0.402	0.057 0.400	0.067 0.334	0.003 0.960	-0.420 0.863	-0.034 0.024	0.195 0.014	1

Note: The table reveals the correlation coefficient of the variables used for the study. The first row in the cell represents the correlation coefficient while the second stands for the p-value.

4.3 Revenue diversification and financial performance

Table 4 shows that revenue diversification of a bank as measured by AHHI has a significant positive effect on a bank's financial performance as measured by ROA, which supports portfolio theory. Even after controlling for bank-specific and macroeconomic variables, the coefficient of revenue diversification on ROA is positive and significant across all confidence intervals. The results suggest that banks with higher revenue diversification have better financial performance as measured by ROA. This finding is contrary to the studies conducted by Staikouras and Wood (2003), Stiroh and Rumble (2006), and De Young and Rice (2004) but is in line with the findings documented by Chiorazzo *et al.* (2008) and Smith *et al.* (2003). Among bank-specific variables, equity to assets and size have significant positive effects, the cost to income, operating expenses to total assets, and non-performing loans to total loans have significant negative effects. The coefficient of size is consistent with Athanasoglou *et al.* (2006), Sufiana *et al.* (2012), and Masood *et al.* (2012), suggesting gains from economies of scale. The significant negative coefficients of cost to income, operating expenses to total assets, and non-performing loan to total loan show that high efficiency and good credit portfolio quality are key drivers of success in banking. The positive effect of equity to total assets on ROA suggests that an increase in bank capitalization translates to higher profits, providing supportive evidence

to the NRB's decision on the increments of the capital of a bank to 8 billion. Surprisingly, the profitability of banks is negatively influenced by the economic growth of the country. This justifies the good performance of banks even in economic downturns in the country. The effect of inflation, another macroeconomic variable used in the study, is inconclusive.

The results of a regression model with Tobin Q as the dependent variable are given in the second panel of Table 4. The effect of revenue diversification on market-based financial performance is similar to the results of regression with accounting-based financial performance for banks. Revenue diversification is positively associated with the market-based performance measured by Tobin Q. The relationship is found to be significant at a 99% confidence level. This finding supports the findings of Natalia *et al.* (2016), Baele *et al.* (2007), and Sawada (2013), which found the positive relationship of diversification with the value of a firm represented by its market-to-book equity ratio. The stock market turns out to anticipate the diversification of revenue resources to improve the potential growth of a bank's return in the future (Natalia *et al.*, 2016). Moreover, Laeven and Levine (2007) stated that a bank with activity switching from traditional to non-interest revenue-based and other investment assets will have a higher value than the traditional one, whereas O/TA, size, and NPL are negatively related to the Tobin Q. The effect of E/A on Tobin Q is inconsistent and insignificant. Regarding macroeconomic variables, GDPG has a significant positive relationship with Tobin Q and INF has an insignificant negative relationship with Tobin Q.

Table 4: Regression estimates

Dependent variables	Const	D	E/A	C/IN	O/TA	NPL	Lnsiz	GDPG	INF	R ²
ROA	3.088	2.191	0.096	-0.057	0.041	-0.024	0.178	-0.051	-0.001	0.672
	0.827	0.835	0.016	0.008	0.040	0.016	0.066	0.040	0.021	
	0.000	0.009	0.000	0.000	0.315	0.131	0.008	0.207	0.982	
Tobin Q	1.664	2.043	-0.004	-0.006	0.023	-0.011	-0.065	0.071	-0.004	0.270
	0.524	0.528	0.008	0.003	0.014	0.011	0.034	0.031	0.018	
	0.000	0.000	0.557	0.045	0.114	0.328/	0.059	0.026	0.784	

Note: The first row of each panel of the table represents regression coefficient whereas Robust standard error and p-value are presented in the second and third-row respectively in the cell.

4.4 Revenue diversification and Bank Risk

Table 5 shows the coefficients of various independent variables on the risk of the Nepali bank. The results of a regression model with insolvency risk as dependent variables are given in Table 5. The results provide evidence that revenue diversification is positively related to the Z score. The p-value is less than 0.01 in all cases, suggesting significance at all confidence intervals. The results suggest that an increment in revenue diversification leads to an increase in Z score, indicating less insolvency risk since a higher Z score value means less insolvency risk. Nepali commercial banks can diversify their risk significantly

by diversifying their income sources. This result is in line with Wolfe and Sanya (2011). Among the bank-specific variables, equity to assets also has a significant positive relationship, and NPL has a significant negative relationship with insolvency risk. The results show that diversification in income sources helps the bank reduce its insolvency risk, and an increase in NPL leads to an increase in insolvency, as expected. Similarly, size is positively related to insolvency risk, while O/TA is negatively related, but both relationships are insignificant. Regarding the macro-economic variables, both have an insignificant negative relationship with bank risk.

Table 5: Regression with Insolvency as Dependent Variable

Dependent variable	Const	D	E/A	C/IN	O/TA	NPL	Lnsiz	GDPG	INF	R ²
Z score	-9.725	39.417	1.094	0.020	0.382	-0.630	1.390	-0.606	-0.537	0.2033
	12.474	9.313	0.350	0.052	0.400	0.169	1.121	0.770	0.308	
	0.312	0.000	0.000	0.693	0.693	0.000	0.216	0.432	0.083	

Note: Regression Coefficients are presented in the first row whereas robust standard error and p-value are presented in the second and third-row respectively in the cell.

4.5.1 Endogeneity and Instrument Variables

This section reveals the results of a regression model using instrumental variables, one of the best methods for dealing with endogeneity. Firstly, the test of endogeneity was carried out using the Durbin (Score) and Wu-Hausman tests to check whether the regression model suffered from endogeneity. Then, the results of the regression model using instrumental variables were presented subsequently.

4.5.2 Test of Endogeneity

The problem of endogeneity has been suspected due to reverse causality between banks' financial performance and risk the revenue diversification. The study used Durbin (Score) and Wu-Hausman tests to check whether the regression model suffered from endogeneity. The null hypothesis of the Durbin and Wu-Hausman tests is that the variable under consideration can be treated as exogenous.

Table 6 shows the P-Value of the regression model with ROA as 0.049 and 0.054 based on the Durbin and Wu-Hausman tests. T-statistics are significant at 5% a significance level. The null hypothesis of the variable being exogenous is rejected. Hence, revenue diversification in these models is endogenous. whereas the p-value of regression models with Z is found to be greater than 0.05 based on both tests. The null hypothesis of the variable being exogenous failed to be rejected. Hence, revenue diversification in this model is not endogenous.

Table 6: Test of Endogeneity Using Durbin (Score) and Wu-Hausman

Model	ROA	TOBIN Q	Z
Durbin (Score)	3.857	6.667	0.880
	0.049	0.009	0.348
Wu- Hausman	3.742	6.557	0.842
	0.054	0.011	0.359

4.5.3 First Stage Regression Results

Table 7 reports the regression results of the first stage of the 2SLS method. The F-statistics greater than 10 show that the instrument is strong enough to proceed to the second stage of the instrumental variables method. Further, the coefficient of OWN is highly statistically significant. Since joint venture banks have a direct relationship with the international bank, they have a competitive advantage in technology advancement and its related operational efficiencies over the local banks. Hence, they are more likely to engage in nontraditional activities relative to their local counterparts. The coefficient for levels of capitalization, as measured by equity to assets, is positive but insignificant. The results support the conventional view that high levels of capitalization place banks in a better position to absorb losses, and hence diversify. The size measured by the natural logarithm of total assets has a positive relationship with revenue diversification, suggesting that bigger banks are better at earning income from various sources of income. The result is contrary to Chiarozza *et al.* (20a).’s findings on European banks, where diversification diminishes with bank size. A significant negative relationship between C/IN and O/TA shows the diversification benefits may originate from reduced operating costs. Regarding macroeconomic controls, GDP growth and inflation (inflation) have positive and negative relationships, respectively. Both are insignificant to the dependent variable, so they cannot explain the effect of revenue diversification.

Table 7: First Stage Regression

Model	Const	E/A	C/IN	O/TA	NPL	Lnsz	GDPG	INF	OWN	R ²	F-stat
D	0.091	0.001	-0.002	-0.008	0.006	0.033	0.007	-0.001	0.039	0.468	22.18
	0.077	0.001	0.000	0.002	0.001	0.006	0.005	0.002	0.010		
	0.241	0.538	0.000	0.000	0.000	0.000	0.172	0.480	0.000		

Note: Regression coefficients are presented in the first row. Robust standard error and p-value are presented in the second and third-row respectively in the cell.

4.5.4 Two-Stage Least Square (2SLS) Regression Estimates

The result of the regression model with the 2SLS regression method is given in Table 8. The coefficient of revenue diversification is positive with all measures of financial performance, even after controlling for endogeneity. The p-value is less than 0.01 and

suggests significance at all confidence intervals. The results provide evidence that banks that have high revenue diversification have better financial performance. Nepali commercial banks can diversify their risk significantly by diversifying their income sources. Among the bank-specific variables, equity to assets and operating cost to total assets also have significant positive relationships with ROA, while the total cost to total assets has a significant negative relationship with ROA. NPL has an insignificant negative relationship with financial performance and insolvency risk. Regarding the macro-economic variables, GDPG and INF have insignificant negative and positive relationships with bank profitability, respectively.

Table 8: Regression with IV Estimation

Model	Const	D	E/A	C/IN	O/TA	NPL	Lnsize	GDP	INF	R ²
ROA	2.873	6.863	0.090	-0.045	0.088	-0.011	0.004	-0.084	0.008	0.5851
	0.812	2.726	0.017	0.008	0.036	0.025	0.127	0.059	0.024	
	0.000	0.013	0.000	0.000	0.015	0.664	0.971	0.154	0.739	
Tobin Q	1.484	5.878	-0.009	0.002	0.062	-0.040	-0.216	0.043	0.002	0.6325
	0.537	1.828	0.012	0.005	0.024	0.166	0.084	0.039	0.016	
	0.006	0.001	0.403	0.635	0.010	0.014	0.010	0.265	0.895	

Note: Regression coefficients are shown in the first row whereas robust standard error and p-value are presented in the second and third-row respectively in the cell.

4.6 Robustness Check

For a further investigation of the effect of revenue diversification on the financial performance and risk of banks, the study performed a robustness check using alternative measures of revenue diversification, particularly NON. NON indicates the percentage of income other than interest out of the total income of banks. The result is presented in Table 9. As can be seen in Table 9, the major empirical findings remain qualitatively unchanged considering alternative measures of revenue diversification. The findings confirmed that spreading income across multiple sources improves a bank's financial performance and lowers its risk. It supports the portfolio hypothesis, suggesting that shifts toward nontraditional activities lead to the improved financial performance of the bank and less risk.

Table 9: Regression Results with Alternative Measure of Revenue Diversification

Model	POOLED OLS			2SLS		
	ROA	TOBIN Q	Z	1 st stage	ROA	TOBIN Q
					2 nd stage	2 nd stage
Const	3.146	1.706	-9.372	5.141	3.049	1.634
	0.824	0.515	12.748	5.858	0.080	0.507
	0.000	0.001	0.463	0.381	0.000	0.001
NON	0.027	0.030	0.524		0.088	0.075
	0.011	0.007	0.118		0.035	0.022
	0.015	0.000	0.000		0.013	0.001
E/A	0.094	-0.006	1.064	0.134	0.085	-0.013
	0.016	0.008	0.352	0.125	0.018	0.011
	0.000	0.413	0.003	0.284	0.000	0.224
C/IN	-0.057	-0.005	0.025	-0.158	-0.045	0.002
	0.007	0.003	0.052	0.029	0.007	0.004
	0.000	0.058	0.631	0.000	0.000	0.599
O/TA	0.039	0.025	0.372	-0.573	0.088	0.058
	0.040	0.014	0.403	0.175	0.035	0.020
	0.326	0.089	0.357	0.001	0.017	0.008
NPL	0.025	-0.013	-0.633	0.513	-0.011	-0.039
	0.016	0.010	0.165	0.104	0.025	0.015
	0.326	0.234	0.000	0.000	0.664	0.013
Lnsize	0.187	-0.071	1.442	2.067	0.013	-0.201
	0.064	0.035	1.121	0.520	0.121	0.076
	0.004	0.043	0.200	0.000	0.911	0.008
GDPG	-0.046	0.073	-0.547	0.443	-0.073	0.053
	0.040	0.031	0.769	0.404	0.058	0.036
	0.250	0.021	0.477	0.275	0.208	0.143
INF	-0.001	-0.004	-0.532	-0.129	0.008	0.002
	0.021	0.017	0.307	0.171	0.024	0.015
	0.981	0.810	0.463	0.451	0.728	0.874
OWN				3.051		
				0.781		
				0.000		
R ²	0.6700	0.2958	0.2038	0.4628	0.0258	0.5874
F-stat				21.64		
Durbin (score)					6.100	3.982
					0.013	0.046
Wu-Hausman					5.984	3.866
					0.015	0.050

Note: Coefficients are shown in the first row whereas robust standard error and p-value are presented in the second and third-row respectively in the cell.

5. Conclusion and discussion

This study examined the effect of revenue diversification on the financial performance and risk of Nepali commercial banks using accounting-based and market-based data. On this basis of analysis, it can be concluded that increased diversification of income sources leads to the improved financial performance of commercial banks as measured by ROA

and Tobin q. The current finding is consistent with Chiorazzo, Milani, and Salvini (2008) and Smith, Staikouras, and Wood (2003) and is in contrast with Staikouras and Wood (2004), Stiroh and Rumble (2006), and De Young and Rice (2004). Hence, banks should diversify their income sources by increasingly diversifying from the traditional intermediation-generating activities to non-intermediation activities. Commercial banks are facing tough competition, hence the need to diversify their sources of income as opposed to relying on traditional intermediation activities for income generation. This will reduce the problem of tough competition in the industry and increase the profitability of the banks. Further, structural changes such as industry deregulation, new information technologies, and financial innovation have also increased the importance of fee income (Albertazzi and Gambacorta, 2009).

The results provided evidence that the banks with higher revenue diversification have higher market-based financial performance as measured by Tobin Q. This finding supports the findings of Natalia *et al.* (2016), Baele *et al.* (2007), and Sawada (2013), which found firms with higher diversification have a higher market value represented by their book equity ratio. The stock market turns out to anticipate the diversification of revenue resources to improve the potential growth of a bank's return in the future (Natalia *et al.*, 2016). Moreover, Laeven and Levine (2007) stated that a bank with activity switching from the traditional to non-interest revenue-based and other investment types of assets will have a higher value than the traditional one.

The study also found that by diversifying revenue sources, banks can minimize the risk. The result is in line with Sawada (2013) and Baele (2007) and contrary to Lepetit *et al.* (2008), which found that higher reliance on non-interest activities is associated with higher risk. The regression results of insolvency risk showed a bank with higher revenue diversification has a higher Z score. The findings of the present study are consistent with Wolfe and Sanya (2011). An increase in revenue diversification of banks leads to an increase in Z score, indicating less insolvency risk since a higher Z score value means less insolvency risk, meaning that concentrated banks have a higher probability of insolvency. The evidence can also be seen from the real example of banks filing bankruptcy because they were only focused on lending activities, even to the fluctuating sectors such as the real sector, for example. The findings of this study support the portfolio theory developed by Markowitz (1952).

The negative coefficient of GDP showed that banks could perform better even in poor economic growth countries. The result is in line with Sufiana *et al.* (2009). This justifies the good performance of banks even in economic downturns in the country. However, the results showed a positive coefficient of GDPG, indicating an increase in shareholder value when the economic condition of the country flourishes. Similarly, the negative GDPG to Z

score coefficient indicates a lower Z score during the nation's good economic conditions, supporting the good financial performance of banks during poor economic conditions. Revell (1979) argued that the effect depends on whether inflation is anticipated or unanticipated. If the inflation rate is fully anticipated, banks can adjust interest rates or manage operating expenses to ensure that revenues increase faster than costs, resulting in higher profitability. If inflation is not fully anticipated, the loan losses will be accumulated, which will lead to a decrease in bank profitability. The negative coefficient of the inflation rate indicated that Nepali banks could not predict inflation correctly. The result is consistent with the findings of a study by Sufiana *et al.* (2009) and is contrary to Athanasoglou *et al.* (2005).

6. Implications

The study will not only inform bank managers to remain competitive but also contribute to the current policy debate on banking regulation. It provides further evidence for bank managers, investors in bank stocks, and bank regulators about the banks' diversification versus focus strategy. The study observed a significant positive relationship between revenue diversification and the financial performance of banks. It provides empirical evidence concerning revenue diversification to help enhance the financial performance of banks. Hence, banks should try to diversify their income sources through various nontraditional activities to enhance their profitability. The inclusion of such activities may enhance the safety and soundness of the banking system. Further, the study observed a significant positive relationship between revenue diversification and Z score. This shows that the increase in revenue diversification would increase the Z score, indicating a decrease in the probability of insolvency since the higher the Z score, the lower the insolvency risk. Thus, it provides evidence that diversification of revenue sources for a bank helps the bank reduce its risk.

From an academic point of view, this study will provide evidence concerning whether the diversification strategy will improve the financial performance of banks and reduce risk. Thus, the findings of this study help shed light on some of these issues and motivate to examine Nepalese banks in the context of revenue diversification in boosting banks' financial performance and bringing about stability.

The Nepali banking market is highly concentrated where commercial banks dominate the majority of market share (more than 78% of total banking assets) in the whole of Nepal. Only listed commercial banks were selected for the study. Other financial institutions and banks were left out of the study. Thus, the results of the study would be more conclusive if those financial institutions and banks had been included. The effect of various components of fee-based income on profitability and stability could not be analyzed, which needs to be looked into in the future. This will help in understanding which components of fee income can contribute to profitability

and stability for banks. Thus, further studies can be conducted with various components of income other than interest. Further studies can also be conducted to check whether there is a non-linear relationship between revenue diversification and risk and return for a bank to suggest the optimum level of diversification for the bank. Nonetheless, despite its numerous limitations, this study should be able to contribute some insight to the field of financial literature.

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