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The impact of industrial diversification on Ethiopian banks' profitability

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Abstract
This paper examines the effect of industrial diversification on financial performance of selected banks from Ethiopia. The data consists 6 years period from 2008/09-2013/14 for ten private and two government commercial banks. Overall, the banks could be said to have diversified their loan portfolios among different industries in Ethiopia. The fixed effects model was used to estimate the regression and industrial diversification was found to have a negative and significant effect on both return on asset and equity. This is another evidence in support of the focus strategy for better profitability.

Keywords: Industrial Diversification, Bank, Performance, Financial intermediaries, Ethiopia

1. Introduction

The essence of Modern Portfolio Theory can be summarized in a sentence or two. It predicts that diversifying into businesses of varying attributes cancels out all unsystematic risk (variability of returns pertaining to a stock/firm specific characteristic) in portfolios as long as the risk-return characteristics of the portfolios are not perfectly positively correlated. This theory, first formulated by Harry Markowitz in 1952 [25], has been advocated and put to test several times and it has been most valuable with substantial practical significance among stock analysts, investors, rating agencies, and managers alike. According to the theory, whether the desired risk reduction effect is achieved does of course depend on the correlation between the different activities or lines of business (in the case of the firms), and on the correlation between the prices of the different investments- in the case of the investing individual (Smith, Staikouras, & Wood, 2003) [34]. Diversification in to unrelated ventures has been popular among individual investors and firms for decades ever since its introduction.

Banks diversify their products, expand into new geographical territories, engage in conglomerate mergers and acquisitions and; lend to widely varying industries and diversify their loan portfolios. This strategy is a subject that is of an enormous interest to finance scholars over which a consensus as to whether it is worthwhile has not been reached. The widely held belief that diversification brings about enhanced performance and reduced risk, has been challenged by many empirical and theoretical works of diversification vis-à-vis specialization and has made it into numerous pages in the strategic and corporate finance literature over the years.

Acharia, Hassan, & Saunders, (2002) substantiate the importance of studying the issue of diversification in the case of banks by pointing to the relative easiness of attaining focus/diversification by banks than standard corporations. Banks are subject to regulatory requirements by central banks to either focus or diversify via branch expansion restrictions. The business strategies that banks execute is subject to intense scrutiny by central banks as the safety and stability of these institution is an important determinant of economic growth and stability (McKinnon, 1973) [26], (Goldsmith, 1969) [17].

Commercial banks in Ethiopia have been diversifying their products, their geographical presence, and their loan portfolios through lending to various industries. A typical bank has diversified its loan portfolio by lending out to several industries in the economy such as agriculture manufacturing domestic and foreign trade hotel and tourism real estate etc. Whether any benefit has accrued to the banks from this strategy in terms of reduced risk and enhanced profitability is an issue that has not been explored previously. This paper intends to investigate the benefits/costs of loan portfolio diversification (or industrial diversification) on the profitability of Ethiopian commercial banks.

2. Review of related literature

It is predicted by Modern portfolio theory that diversifying into businesses of varying attributes cancels out all unsystematic risk (variability of returns pertaining to a stock/firm specific characteristic). This holds as long as the returns (and the covariance there of) of the portfolios do not move in the same direction. It holds even in situations where the assets in the basket have returns that are positively correlated but not perfectly so (Markowitz, 1952) [25], (Sharpe, 1964) [31].

However plausible the Markowitz's portfolio selection theory might have been in explaining a portfolio's risk/return profile from the Wall Street investor's perspective, there is an intense and ongoing debate among scholars whether the diversification strategy is worth the while. This has been a bit of a conundrum for quite some time. Some financial theorists try to prescribe diversification arguing that the synergistic effect of different assets pooled together boosts reported performance, efficiency or market valuations. Some theorize and also provide evidence that diversified firms are less risky ((Boyd, Graham, & Hewitt, 1993) [7], (Templeton & Severiens, 1992) [39], (Pandya & Rao, 1998) [27], (Lown, Osler, Sufi, & Strahan, 2000)) [23].

Others advise against the diversification strategy on many grounds and provide evidence of decreased returns, increased exposure or risk of failure and loss or dissipation of shareholders' wealth and even diseconomies of scale associated with increased diversification to support their claim ((Lang & Stulz, 1994) [21], (Berger & Ofec, 1995) [4], (Comment & Jarrel, 1995) [9], (Stiroh KJ., 2002) [35, 36], (Hayden, Porath, & Westernhagen, 2007) [18], (Laeven & Levine, 2007) [2], (Delong, 2001)) [11]. The differences and, at times, the contradictions among findings of studies on the issue of diversification can be due to differences in models/perspectives by scholars, complexity of the nature of the relationship between performance and diversification and intervening variables (mode of diversification, institutional context, managerial capability, ownership structure) that affect the way diversification and the performance measures (returns on assets, returns on equity, efficiency measures, stability/variability of returns, market valuations, are related) (Pandya & Rao, 1998) [27].

The most popular theory that informed many studies against diversification strategy is agency theory. It characterizes diversification as sub optimal strategy when done at a firm level. According to Jensen (1986) [19], such moves as expanding the firm to new businesses, or entering to new geographic areas either through mergers or hostile takeovers by management is not in the best interest of outside stockholders. He argues that corporate diversification programs exemplify the theory that managers of firms with unused borrowing power and large free cash flows are more likely to undertake low-benefit or even value-destroying investments.

There are several empirical works on the issue of how organizational performance, risk and, the level of industrial diversification are related in banks. Some scholars argue that banks should lend to the industries that they know very well so as to take greatest advantage of management's expertise and reduce agency problems (Jensen, 1986) [19], (Berger & Ofek, 1996) [5], (Servaes, 1995) [30], and (Denis, Denis, & Sarin, 1997) [12]. Focusing as opposed to diversification helps banks minimize their risk of failure and enjoy reduced cost which is the building block to a stable financial environment. (Acharia, Hassan, & Saunders, 2002) put forth the following reasons why lending to new industries may not be the best strategy banks should pursue. They are:

- Banks' lack of monitoring expertise in lending to a new sector when learning costs are present;
- Exposure to an adverse selection and a "winner's curse" effect when the loan sector to which banks migrate is already being supplied with credit by other banks. It also is unattractive to banks as it induces fierce competition among banks.
- It can cause a bank to grow in size, subjecting it to agency–based scale inefficiencies. Bank for International Settlements (BIS, 1991) on the other hand stressed that concentration of loans and exposure to one particular economic or geographical sectors, makes the lending bank vulnerable to a weakness in a particular industry or region. The Basel Committee on Banking Supervision explicitly stated that many banking crises for decades were caused by loan concentration.

Winton, (1999) argued that whether portfolio diversification benefits depends on where a bank is located in the risk exposure spectrum. It helps when banks are exposed on moderate exposure to sector downturns and their monitoring incentives are weak. When loans have low downside risk diversification has little benefit and if the loans have higher downside risk; diversification may actually tend to increase the bank's chance of failure. In addition if banks are new to sectors they are lending to, diversification produces lowers average returns on monitored loans. This in effect reduces monitoring incentive and is more likely to increase the bank's chance of failure. Acharia, Hassan, & Saunders, (2002) conducted an examination of industrial, sectoral and geographic exposures using data on 105 Italian banks for the period 1993-1999. They hypothesized that, banks' monitoring ability deteriorates as they enter into newer and more competitive industries. Among their findings is that industrial loan diversification reduces bank return while endogenously producing riskier loans for all banks in the sample and this effect is most powerful for high risk banks. Their methodology was later replicated in 2003 on Canadian banks by D'Souza & Lai, (2003) [10]. Their results are found to be consistent with those obtained by Acharia, Hassan, & Saunders, (2002).

Behr, Kamp, Memmel, & Pfingsten, (2007) used data from all German banks for the period from 1993 to 2003 to investigate the issue of loan portfolio diversification. Their study revealed that specialized banks have a slightly higher return; have a slightly smaller amount of loan loss provision and non-performing loan ratios and; the standard deviations of loan loss provisions and non-performing loan ratios are smaller for diversified banks. Using bank data on Chinese banks, Berger, Hassan and Zhou (2010) investigated the issue and their study showed that industrial diversification is associated with reduced profits and higher costs. More recently, Tabak, Fazio, & Cajueiro, (2011), assessed whether diversification of the credit portfolio at the bank level leads to better performance and lower risk in Brazilian banking industry. They found corroborating evidence to previous studies' results that loan portfolio concentration increases returns and also reduces default risk. In Summary, much of the literature has presented a pile of evidence against the pursuit of industrial diversification by banks and financial institutions alike.

3. Methodology

Data and Sample

All private and government commercial banks that have operated and have issued annual reports for at least five years have been included in the study except the Development Bank of Ethiopia, which is set up specifically to help execute government policies. This leaves a total of twelve banks and the study covers the period 2008/09 to 2013/14. The data type secondary in its entirety and is gathered from the banks' annual reports, reports from the National Bank of Ethiopia, and annual reports from the Ministry of Finance and Economic Development.

Variables

The relationship between the banks' industrial diversification and their financial performance is tested econometrically by identifying, three sets of variables (the independent variable, the dependent variables and control variables). These

vartiables are measured and their relationship analyzed using the Stata 12 statistical package.

Dependent Variables

As measures of profitability, Return on Assets (ROA), and return on Equity (ROE) are calculated as the ratio of after tax income to total assets and to total equity respectively. These measures show the percentage of profit that a company earns in relation to its overall resources.

Industrial Diversification

Data on industrial diversification is gathered from notes accompanying the financial statements in the audited annual reports. A typical bank's breakdown of loans and advances by industry contains (but not limited to) the following entries.

- Agriculture,
- Building and construction,
- Import,
- Export,
- Manufacturing,
- Merchandise,
- Personal,
- Loans to staff,
- Domestic trade, and services,
- Hotel and tourism,
- Health services
- Others

The disclosures relating to the loans and advances differ from one bank to another. Hence, following (Acharia, Hassan, & Saunders, 2002) these line items in the notes to financial statements were re-classified in to six broad economic sectors. The broader classifications are:

- Agriculture,
- Building and Construction,
- Foreign trade (Constitutes, imports, exports and, advances on LC),
- Domestic trade and services,
- Personal loan
- Manufacturing
- Others (includes all the other items that were not put in any of the above categories)

The degree of industrial diversification is measured by constructing the Herfindhal Hirschman index. It is given by:

$$HHI\_Ind = 1 - \sum_{j=1}^{k} \left(\frac{X_{ijt}}{X_{it}}\right)^2$$

Where HHI_Ind measures a bank's industrial diversification is the amount of loans provided to a particular industry. The subscripts, represent the banks, the industries and year respectively (j= 1, 2, 3… k, where k is equal to the seven categories that are identified above. The values of this measure range from 0 to where the value 1 highlights maximum industrial diversification, (with branches equally distributed among the seven industries where as values close to zero represent no geographic diversification at all. A negative impact of industrial diversification on profitability is expected. Company specific and macro level control variables that are presumed to impact the profitability of the banks are discussed below.

Bank Size

According to Short, (1979) big banks are more profitable and have better capital adequacy than small banks. Shehzad, Haan, & Scholtens, (2013) found this to be the case in a study where they investigated bank profitability in OECD countries. This finding was a direct contrast to Athanasoglou, Brissimis, & Delis, (2008) and Goddard, Molyneux, & Wilson, (2004) who studied European banks and found a weak relationship between size and profitability. In this paper, bank size is measured by taking the natural logarithm of average assets of the banks and a positive effect on profitability is expected.

Capital (CAR)

Flamini, (2009) [15], affirms that banks regard capital restriction imposed by central banks as an opportunity cost. To the extent that banks try to pass some of the regulatory cost on to their customers, a positive relationship may be anticipated between capital and profit. In September 2011, **t**he National Bank of Ethiopia issued a directive that requires commercial banks to show a capital of 500 million Br. This was an abrupt jump from the previously set floor of 75 million birr. Since the banking sector in Ethiopia is strictly regulated and banks could not transfer this regulatory cost to their customers, a negative relation between capital and profitability (or conversely, a positive association between leverage and profit) is expected.

Liquidity (LQR)

Liquid assets such as cash (either on hand or reserve requirements by central banks) and government securities generally have relatively low returns. Holding them imposes an opportunity cost on banks (Bordeleau & Christopher, 2010). On the other hand, according to Athanasoglou, Brissimis, & Delis, (2008), low levels of liquidity is a major cause of bank failures and financial institutions may decide to diversify their portfolios and/or raise their liquid holdings in order to reduce their risk during periods of increased uncertainty. Ethiopian banks are required to maintain liquid assets of not less than fifteen percent (15%) of their net current liabilities. Liquidity is the least of the banks' worries though, as they have managed to hold more than 30 percent of their assets in liquid forms over the years. The expected sign of this variable is negative in the regression outputs.

Credit Risk (LLR)

Following Athanasoglou, Brissimis, & Delis, (2008) we use the ratio of loan loss provisions to total assets to proxy for the level of credit risk the banks are exposed to. Poor loan screening and monitoring practices result in a higher value of this ratio. This variable is expected to have a negative effect on the banks' earnings.

Inflation (INFN)

According to Perry, (1992) it is whether banks can effectively anticipate an impending inflation that decides how it affects their profitability. If banks are able to make reasonable forecast of inflation then they may be able to adjust their interest rates beforehand to counter the increase in operating costs. Inflation and profitability of banks may therefore be associated positively. The variable inflation is expected to have a negative sign in the regression outputs.

GDP

Growing GDP (favorable economic condition) is expected to influence various factors that in turn affect the supply of (demand for) deposits and funds. On the other hand, as GDP growth slows down and in particular, during recessions, credit quality deteriorates and defaults increase, thus reducing bank returns (Flamini, 2009) [15]. This variable is expected to have a positive effect on the profitability of the banks.

Model Specification

We model the relationship between bank profitability and industrial diversification as follows.

$$y_{it} = \alpha + \beta_1 HHI\_Ind_{it} + \beta_2 SIZE_{it} + \beta_3 CAR_{it} + \beta_4 LLR_{it} + \beta_5 LIQ_{it} + \beta_6 GDP + \beta_7 INFN + \varepsilon_{it}$$

Where refers to a bank's financial performance (either return on asset or equity). The subscripts t and i denote year and individual banks respectively. The coefficients of the explanatory variables (discussed above) are denoted by the parameters, through to = μ +, where μ is the unobserved heterogeneity that is time invariant and, the idiosyncratic error that varies over time and entities. The Hausman test shows that the fixed effects model is appropriate to estimate the model.

4. Results and Discussion

Descriptive statistics presented in table 1 shows that the mean measure of industrial diversification (Mean Herfindhal Index) was 0.70 with a maximum and minimum value of 0.80 and 0.28 respectively. Over all, the banks can be described as diversified than focused.

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ROAA	63	3.0668	0.8511	0.0855	4.9511
ROAE	63	24.4201	8.0050	0.6736	40.4437
HHI-IND	52	0.7014	0.1337	0.2866	0.8014
SIZE	63	22.5047	0.8897	20.3982	24.9250
CAR	63	13.2446	3.5311	7.9144	22.0974
LLR	56	0.9082	0.4783	0.0792	1.9354
LIQ	63	37.3603	11.4642	15.8000	57.0000
GDP	63	2.3040	0.0812	2.1633	2.4336
INFN	63	18.2873	12.5310	2.8000	36.4000

The correlation matrix reported in table 2 below does not show strong correlation among any two of the independent variables which indicates that there is no problem of multicollinearity in the model.

As pleasant as the fact that the banks have a well-diversified loan portfolio for an advocate of the diversification strategy, a further examination of the relationship between these variables and the profitability measures relate quite a different story.

Table 2: Correlation Matrix

	HHI_IND	Size	CAR	LNLLR	LQR	GDP	INFN
HHI_IND	1.00						
Size	0.51	1.00					
CAR	0.03	-0.35	1.00				
LLR	0.35	0.41	-0.31	1.00			
LQR	-0.12	-0.32	0.17	0.17	1.00		
GDP	-0.01	-0.04	0.00	0.09	0.27	1.00	
INFN	-0.04	-0.07	-0.07	0.12	0.02	-0.57	1.00

The regression output presented below shows that industrial diversification has a statistically significant negative effect on both measures of profitability. The negative coefficients of the Herfindahl Indices can be interpreted as confirmation that (at least on average) the mean profits arising from focusing loan portfolios exceed the mean profits achievable through diversification.

Table 3: Regression Results Based on the Fixed Effects Model

	1 ROE	2 ROA
HHI_IND	-59.02**	-8.192**
	0.0089	0.0046
SIZE	10.61***	1.436***
	0.0005	0.0002
CAR	-0.787	0.0549
	0.1743	0.4497
LLR	1.105	0.251
	0.6962	0.4856
LIQ	0.308*	0.0386*
	0.0107	0.0115
GDP	-5.983	-0.885
	0.5351	0.4696
INFN	0.0376	0.00397
	0.5687	0.6349
_cons	-161.8*	-23.87*
	0.0273	0.0113
N	48	48
R-sq	0.492	0.4492

p-values in parentheses. * p<0.05, ** p<0.01, *** p<0.001

Whereas Diamond, (1984) [14] comes to the conclusion that a bank maximizes the gains from delegated monitoring by perfect diversification, this result from Ethiopian commercial banks seem to lend support to (Winton, 1999) [40] assertion that if banks are new to the sectors they are lending to, diversification produces lower average returns which in effect reduces monitoring incentive and is more likely to increase the bank's chance of failure. Acharia, Hassan, & Saunders, (2002) [1] also made similar case in their study revealed that when a bank expands into industries where it faces fierce competition or when its lending experience is limited, diseconomies results in the form of poor monitoring incentives and/or greater default risk of loan portfolios. They commended a banking sector with several focused and specialized banks rather than a few big and diversified ones for a financial system to be stable. The same result as Acharia, Hassan, & Saunders, (2002) [1] was obtained by D'Souza & Lai, (2003) [10]. Prior to Winton, (Petersen & Rajan, 1994) [29] have indicated that diversification comes at a cost. The spread into new sectors in order to reach a more diversified portfolio may entail substantial learning costs. Banks are good at collecting and processing information, but they need some time to establish meaningful lending relationships. In the meantime, the ability to pick and monitor these new borrowers may be jeopardized (Petersen & Rajan, 1994) [29] as cited in (Bebczuk & Galindo, 2008) [3].

Size (natural logarithm of total assets) has a positive and statistically significant impact on both measures of returns as expected. Capital ratio (CAR) is found to have no effect on performance during sample period. GDP growth and inflation are found to be negatively related to bank profitability but the coefficients are not statistically significant. The negative sign for GDP lends support to the view that improved economy

and the resulting developed business environment lowers bank entry barriers and intensifies competition harming the banks' profitability according to (Tan & Floros, 2012)

5. References

1. Acharia VV, Hassan I, Saunders A. Should banks be diversified? Evidence from individual bank loan portfolios. Journal of Business. 2002; 79:1355-1412.
2. Athanasoglou PP, Brissimis SN, Delis MD. Bank-specific, industry-specific and macroeconomic determinants of bank profitability, Journal of International Financial Markets Institutions and Money. 2008; 18:121-36.
3. Bebczuk R, Galindo A. Financial crisis and sectoral diversification of Argentine banks, 1999-2004. Applied Financial Economics. 2008, 199-211.
4. Berger PG, Ofec E. Diversification's Effect on Firm Value. Journal of Financial Economics. 1995; 37:39-65.
5. Berger P, Ofek E. Bustup takeovers of value destroying diversified firms. Journal of Finance. 1996; 51:1175-1200.
6. Bordeleau É, Christopher G. The Impact of Liquidity on Bank Profitability. Bank of Canada Working 2010, 38.
7. Boyd JH, Graham SL, Hewitt RS. Bank holding company mergers with nonbank financial firms: Effects on the risk of failure. Journal of Banking & Finance. 1993; 17(1):43-63.
8. Chakrabarti R. Banking in India-Reforms and Reorganization, 2005. http://ssrn.com/abstract=649855.
9. Comment R, Jarrel G. Corporate Focus and Stock Returns. Journal of Finanicial Economics. 1995; 37:67-87.
10. D'Souza C, Lai A. Does Diversification Improve Bank Efficiency? Proceedings by bank of Canada, 2003.
11. Delong G. Stockholder gains from focusing versus diversifying bank mergers. Journal of Financial Economics. 2001; 59(2):221-252.
12. Denis DJ, Denis DK, Sarin A. Agency Problems, Equity Ownership, and Corporate Diversification. Journal of Finance. 1997; 52(1):135-160.
13. Deyoung R, Roland KP. Product Mix and Earnings Volatility at Commercial Banks: Evidence from a Degree of Total Leverage Model. Journal of Financial Intermediation. 2001; 10:54-84.
14. Diamond D. Financial Intermediation and Delegated Monitoring. Review of Economic Studies. 1984; 59:393-414.
15. Flamini V. The Determinants of Commercial Bank Profitability in Sub-Saharan Africa. IMF, 2009.
16. Goddard J, Molyneux P, Wilson JO. The profitability of European banks: a cross-sectional and dynamic panel analysis. Manchester School. 2004; 72:363-81.
17. Goldsmith R. Financial Structure and Development. New Haven: Yale University Press, 1969.
18. Hayden E, Porath D, Westernhagen NV. Does diversification improve the performance of German banks? Evidence from individual bank loan portfolios, Journal of Financial Services Research. 2007; 32:123-140.
19. Jensen MC. Agency costs of free cash flow, corporate finance, and takeovers. American Economic Review. 1986; 76:323-329.
20. Laeven L, Levine R. Is there a diversification discount in financial conglomerates? Journal of Financial Economics. 2007; 85:331-367.
21. Lang LH, Stulz RM. Tobin's q, corporate diversification and firm performance. Journal of Political Economy. 1994; 102:1248-1280.
22. Lepetit L, Nys E, Rous P, Tarazi A. Product diversification in the European banking industry: Risk and loan pricing implications, 2005. SSRN No. 873490.
23. Lown CS, Osler CL, Sufi A, Strahan PE, 2000.
24. The Changing Landscape of the Financial Services Industry: What Lies Ahead? FRB of New York Economic Policy Review. 2000; 6(4):39-55.
25. Markowitz H. Portfolio Selection. Journal of Finance. 1952, 77-91.
26. McKinnon RI. Money and Capital in Economic Development. Washington: Brookings Institution Press, 1973.
27. Pandya MA, Rao VR. Diversification and Firm Performance: An Empirical Evaluation. Journal of Financial and Strategic Decisions. 1998; 11:67-81.
28. Perry P. Do banks gain or lose from inflation. Journal of Retail Banking. 1992; 14(2):25-30.
29. Petersen M, Rajan R. The Benefits of Firm-Creditor Relationship: Evidence from Small Business Data. Journal of Finance, 1994.
30. Servaes H. The value of diversification during the conglomerate merger wave, Journal of Finance, forthcoming, 1995.
31. Sharpe W. Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk. Journal of Finance. 1964, 425-442.
32. Shehzad CT, Haan JD, Scholtens B. The relationship between size, growth and profitability of commercial banks, Applied Economics. 2013; 45(13):1751-1765.
33. Short B. The relation between commercial bank profit rates and banking concentration in Canada, Western Europe and Japan. Journal of Banking and Finance. 1979 3.
34. Smith R, Staikouras C, Wood G. Non-interest income and total income stability. Bank of England working papers. 2003, 198.
35. Stiroh KJ. Diversification in Banking: Is Noninterest Income the Answer? New York: federal Reserve Bank of New York, 2002.
36. Stiroh KJ. Diversification in Banking: Is Noninterest Income the Answer? Staff report, Federal Reserve Bank of New York, 2002.
37. Tabak BM, Fazio DM, Cajueiro DO. The effects of loan portfolio concentration on Brazilian banks' return and risk. Journal of Banking & Finance. 2011; 35:3065-3076.
38. Tan Y, Floros C. Bank profitability and inflation: the case of China. Journal of Economic Studies, 2012a, 39.
39. Templeton WK, Severiens JT. The Effect of Nonbank Diversification on Bank Holding Company Risk. Quarterly Journal of Business and Economics. 1992; 31:3-17.
40. Winton A. Don't Put All Your Eggs in One Basket? Diversification and Specialization in Lending, Working Paper, University of Minnesota, 1999.