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An Empirical Study on the Effect of Credit Concentration on DSE Listed Banks' Risk and Return

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Abstract
This study makes an endeavor to experimentally find out the impact of credit concentration on DSE (Dhaka Stock Exchange) listed banks' risk and return. Banking industry in Bangladesh is going through a turbulent situation due to increase in the size of NPL (Non-Performing Loan) which undermines banks' profitability. The objective of this paper is to assess the impact of credit concentration on banks' risk and return. We took Hirshmann-Herfindahl Index to measure the portfolio concentration, RoE (Return on Equity) as measurement of banks' return and NPL (Non-Performing Loan) as measurement of banks risk. In this report we have collected data of five DSE (Dhaka Stock Exchange) listed private commercial banks from 2014 to 2018. We found that the concentration is highest in manufacturing, trade finance and readymade garments sector. Of the total loan portfolio of five banks from 2014 to 2018, 34% is concentrated in manufacturing sector, 19% is concentrated in trade finance, and 18% is concentrated in RMG (Ready Made Garments). The banks have lowest concentration in agricultural sector 2% of its total loan portfolio is given to agricultural sector on average during the period of study. Although concentration in SME (Small and Medium-sized Enterprises) sector, one of the most promising sectors in our country, is increasing but even then the portfolio concentration in SME sector is barely 8%. We regressed the concentration measure on banks NPL (Non-Performing Loan) and ROE (Return on Equity). The major findings we got are bank's return and loan concentration is inversely related and this relationship is established at 5% significance level. However, insignificant relationship is found between loan concentration and NPL (Non-Performing Loan). The recommendations for the banking sector are banks should diversify their portfolio as it would yield more return for the shareholders' of the banks, more extensive study is required to establish the relation between NPL(Non-Performing Loan) and loan concentration, bank should increase its size of portfolio in the SME (Small and Medium-sized Enterprises) sector which is a promising sector for an emerging economy, and banks should try to reduce their loan concentration to the optimum level for RMG (Ready Made Garments), trade finance and manufacturing industry.

Keywords: Credit Concentration, DSE Banks, Risk and Return

1. Background

This study assesses empirically whether banks operating within the banking system in Bangladesh concentrate or diversify their credit portfolio and how this choice impacts their performance and risk. Several countries possess a set of rules limiting a bank's exposure to one single borrower, which is considered an argument in favor of the

necessity of diversification. In contrast, there are many banks that decide to specialize their loans activities to sectors in which they enjoy comparative advantage.
Traditional banking theory argues that banks should diversify their credit portfolio, given that through the expansion of their credit lines to new sectors, the bank's probability of default will be reduced. The idea is that due to asymmetric information, diversification reduces financial intermediation costs. Moreover, less diversified banks would be more vulnerable to economic downturns, since they are exposed to few sectors. Many banking crises in past were caused by, among other reasons, concentration in bank's loan portfolios, which supports the view that risk is highly associated with this strategy. When the risks are low, banks may benefit more from specialization than from diversifying, since there is a low probability of failure.

Employing different measures as proxies of loan portfolio concentration, our primary goal is to identify the influence of loan concentration on Bangladeshi banks return. After that, we also observe how risks, interacted with concentration measures. Finally, we estimate the impact of loan concentration on bank's risk, which indicate whether the banks' monitoring decisions are effective or not.

1.1. Objective of the study

The objective of this strategy is to determine the impact of loan concentration on banks' risk and return.
In determining the loan concentration's impact on banks return we will use the following hypothesis.
H_0: There is no relationship between loan concentration and bank's return
H_1: There is significant relationship between loan concentration and bank's return
In case of determining the effect of loan concentration on banks' risk we will use the following hypothesis
H_0: There is no relationship between loan concentration and bank's risk
H_1: There is significant relationship between loan concentration and bank's return.

2. Methodology of the Study

2.1. Nature of the study

The report is titled "An Empirical Study on the Effect of Credit Concentration on DSE Listed Banks' Risk and Return". This particular report will conducted quantitative analysis to determine the effect of loan concentration on banks risk and return.

2.2. Sources of Data

The primary source of data used for this report is the annual reports of the banks under study.

2.3. Population Size

The population size of the study would be the total numbers of schedule banks listed in Dhaka Stock Exchange. The total number of schedule bank listed in Dhaka Stock Exchange that takes their license from the central bank is considered as the total population of the study. The non-scheduled bank is not considered as the subject of study in this regard.

2.4. Sample size

The sample size of our study is 5 schedule banks listed in Dhaka Stock Exchange. The time frame of the study would be from year 2014 - 2018. The private commercial banks are chosen to avoid any result complication that might be present due to any differences in ownership structure.

2.5. Sampling Design

In this study, we have used convenience sampling. Therefore, we have collected the data for those banks whose data are easily available.

2.6. Sample type

We used panel data for the purpose of our study. The panel data sample of five banks for the last five years gives us 25 numbers of observations. The panel data is used to ensure that the result of this study gives us a reliable result.

2.7. Variables used

The variables used to as proxy of return is *ROE (Return on Equity),* it is the ratio of net income to total shareholders' equity. It is used as proxy of return because this ratio shows how much return the entrepreneur of the banks' has generated using their investment.

The variable use as proxy of risk is the *NPL (Non-Performing Loan) ratio;* it is the ratio of total non-performing loans to the total outstanding loans and advances. It is used as a proxy for banks' return because the main asset of any bank is its loan and advances and if any loan becomes non-performing it is a matter of grave concern for banks' profitability and increase in the NPL ratio represents an increase in banks' risk.

2.8. Concentration Measures

As proxies of concentration, we consider, in this study, one traditional concentration measures the Hirshmann-Herfindahl Index (HHI). It is important to highlight that the object of our analysis is the composition of the industrial sector in the bank's loan portfolio, i.e. the bank's relative exposures to the different industries. Thus, the concentration measures will be used to estimate and verify the effect of loan concentration in one or more economic sector on banks' returns.

Before illustrating how the concentration measures are calculated, we define relative exposure (*ri*) of the bank *b* at time *t* to each economic sector *i* as:

$$ri = \frac{Nominal\ Exposure_{bti}}{Total\ Exposure_{bti}}$$

The HHI, i.e. the sum of the squares of the relative exposures, has been one the most known concentration measure in industrial organization and in the studies about this matter, due to its relatively simplicity. The HHI of bank *b* at time *t* can be defined as:

$$HHI = \sum_{i=1}^{n} r_i^2$$

Note that the inferior limit of the HHI is $\frac{1}{n}$ and represents a perfect diversified portfolio, meaning an equal share of exposure to each sector *n*. On the other hand, if the HHI is equal to 1, all loans are handed out to only one industry, i.e. a perfect specialization scenario. An advantage of this index is that the higher its value, the higher the concentration**.**

For the purpose of our study we selected 13 sectors where the loan is provided. So, in our case the inferior limit of the HHI is 0.08 which represents a perfectly diversified portfolio and 1 represent an extremely concentrated portfolio.

2.8.1. The relationships between banks return and loan portfolio concentration

The most basic question regarding to this topic is whether loan portfolio concentration results in higher returns. It can be answered by regressing returns on a concentration measure, as in the following regression:

$$ROE_t = \beta_0 + \beta_1 . CM_t + \epsilon_t$$

where ROE_t is the return of bank at time t measured by the Return on Equity. CM_t *(Concentration Measure)* represents, separately, the concentration measures of bank at time *t*.

2.8.2. The relationship between banks risk and loan portfolio concentration

Another slope of our analysis takes into account the relationship between concentration and risk. For this purpose, we employ the natural logarithm of the the Non-Performing Loans. Then, the main idea is to regress this variable on CM_t.

$$NPL_t = \alpha_0 + \alpha_1 CM_t + \varepsilon_t$$

where NPL_t is the risk measure of bank at time *t* which turns into bad asset. CM_t represents, separately, the concentration measures explained before of bank at time *t*.

3. Literature Review

Traditional banking theory argues that banks should diversify their credit portfolio, given that through the expansion of their credit lines to new sectors, the bank's probability of default will be reduced (Diamond, 1984). The idea is that due to asymmetric information, diversification reduces financial intermediation costs. Moreover, less diversified banks would be more vulnerable to economic downturns, since they are exposed to few sectors. Many banking crises in the last 25 years were caused by, among other reasons, concentration in bank's loan portfolios, which supports the view that risk is highly associated with this strategy (BIS, 1991). This view is also empirically supported by Argentinean banks on the Argentinean financial crisis of 2001 and 2002 (Bebczuk and Galindo, 2008) and by Austrian banks over the years 1997-2003 (Rossi et al., 2009). On the other hand, the theory of corporate finance supports the idea that firms should concentrate their activities on a specific sector or group of sectors to take benefits of expertise in how business are done in these sectors (Jensen, 1986; Denis et al., 1997; Meyer and Yeager, 2001; Stomper, 2004; Acharya et al., 2006). Another argument against portfolio diversification is that it can also result in increasing competition with other banks, making this strategy less attractive. In particular, Winton (1999) defends that diversification only reduces the chances of bank failure in the case of moderated risks of default. When the risks are low, banks may benefit more from specialization than from diversifying, since there is a low probability of failure. Conversely, when the probabilities of insolvency are high, diversification may even worsen the situation, since the bank will be exposed to many sectors, and the downturn of one may be enough to lead this bank to bankruptcy. Furthermore, there is also empirical evidence that diversification increases the risk in the Italian banking sector (Acharya et al., 2006) and in the German banking sector (Kamp et al., 2006) and diversification reduces the performances of the banks in the Chinese banking sector (Berger et al., 2010) and in the German banking sector (Norden and Szerencses, 2005; Hayden et al., 2007). Independently from these two main views, Kamp et al. (2007) show that neither of the theories mentioned above are completely right for the entire German banking sector in the period from 1993 to 2003. They find that the main benefit of diversifying credit portfolios is the achievement of relative lower levels of risk compared to concentrated portfolios. The returns of concentrated portfolios, however, seem to be higher than those of diversified banks. The authors conclude that the typical risk-return trade-off appears to be the solution of this analysis, leaving banks to choose their own strategy in order to maximize their performance.

It is worth mentioning that most of the studies published about this matter so far focus their attention in the banking sectors of developed countries, such as the U.S. and Germany. With the exception of Bebczuk and Galindo (2008) and Berger et al. (2010), there is a lack of evidence and discussion regarding the effects of the loan portfolio composition on banks of emerging economies. Given the uniqueness of their economic conditions, the results may be different from those observed in developed countries. This article contributes to the literature by proposing to examine the effects of loan portfolio strategies on the performance of Banks operating in Bangladesh.

4. Loan Concentration Scenario of Different Banks in Study

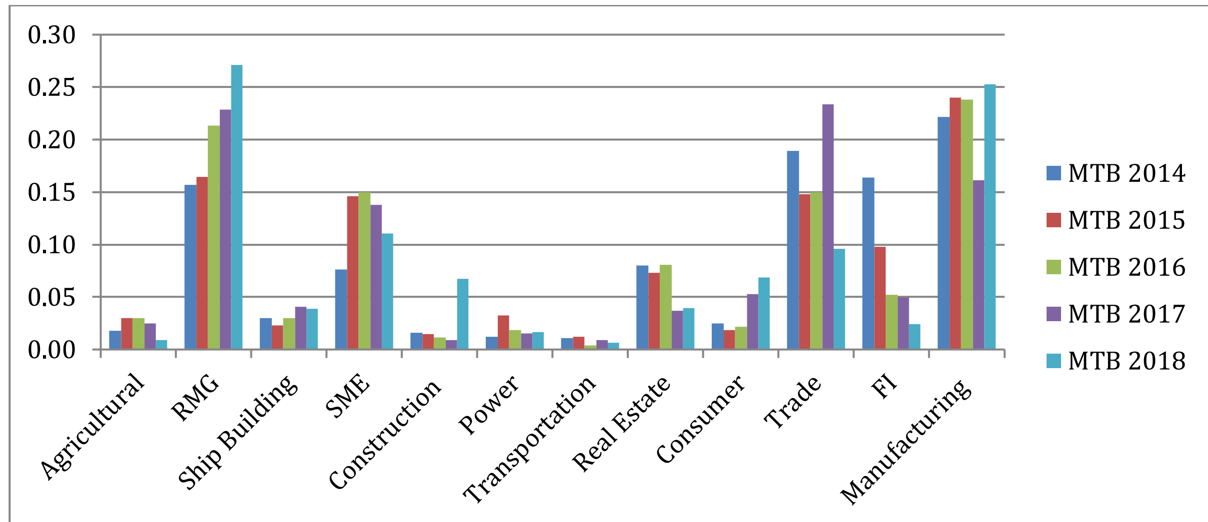

Figure 1: Loan concentration Scenario of MTB (Mutual Trust Bank Ltd.) from 2014-2018.

The table above shows the loan concentration scenario of MTB from the year 2014 to 2018. The bank is focusing largely on manufacturing industry other than trade and RMG in 2014 and 2015. However, from the year 2016 to 2018 the focus largely is directed towards the RMG sector with 23% of its loan portfolio going to the RMG sector in year 2017 and 27% in 2018.

The concentration towards the agriculture sector is very minimal ranging from 1% to 3% during the period of study. Moreover, in 2018 the loan concentration in the agricultural sector is barely 1% of its total loan portfolio.

In 2016 the bank provides 16% of its total loan which is highest concentration in this sector in the last 5 year. However, the concentration in this sector is decline for the last two years for MTB.

In trade the concentration is highest in 2017 around 23%. In construction, power and transportation sector the loan concentration is 7%, 2% and 1% respectively.

The concentration in the ship building industry is around 3-5% for the last 5 years. The concentration in the consumer sector is showing a rising trend. MTB recently is increasing its focus in consumer financing.

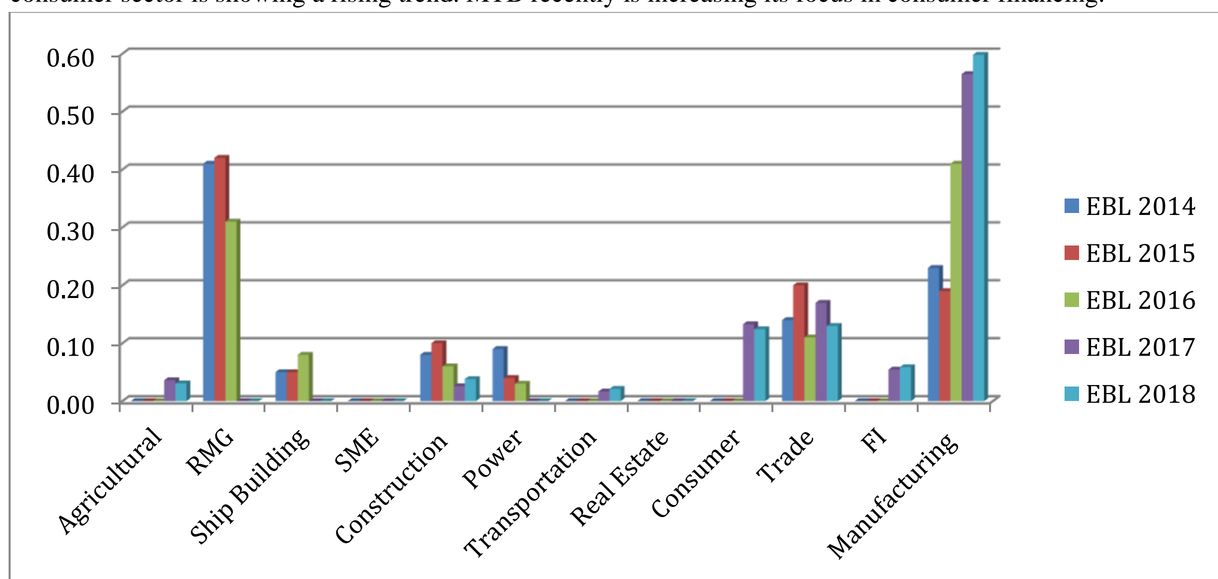

Figure 2: Loan concentration Scenario of EBL (Eastern Bank Ltd.) from 2014-2018

Agricultural loan concentration of EBL is on 4% and 3% in 2017 and 2108 respectively.

The bank's loan is highly concentrated in RMG sector. The bank has 42% loan concentration in RMG sector in 2015. The bank has 4% loan portfolio concentration in construction sector. The loan concentration in the power sector is declining the concentration is 9% in 2014 which reduced to 3% in 2016.

EBL's concentration in transportation and real estate is bare minimum. The bank is focusing in consumer sector the loan concentration in consumer sector is 13% and 12% of the loan portfolio in 2017 and 2018 respectively.

In trade sector the loan concentration is around 15%-20% during the period of study. The bank is focused in trade finance.

EBL's concentration in ship building industry is around 5%-8% during the period of study. The bank has bare minimum focus in SME sector. EBL's loan concentration in manufacturing sector other than RMG sector is showing an increasing trend. In 2014 the concentration in this sector is 23% whereas it rose to 60% concentration in 2018.

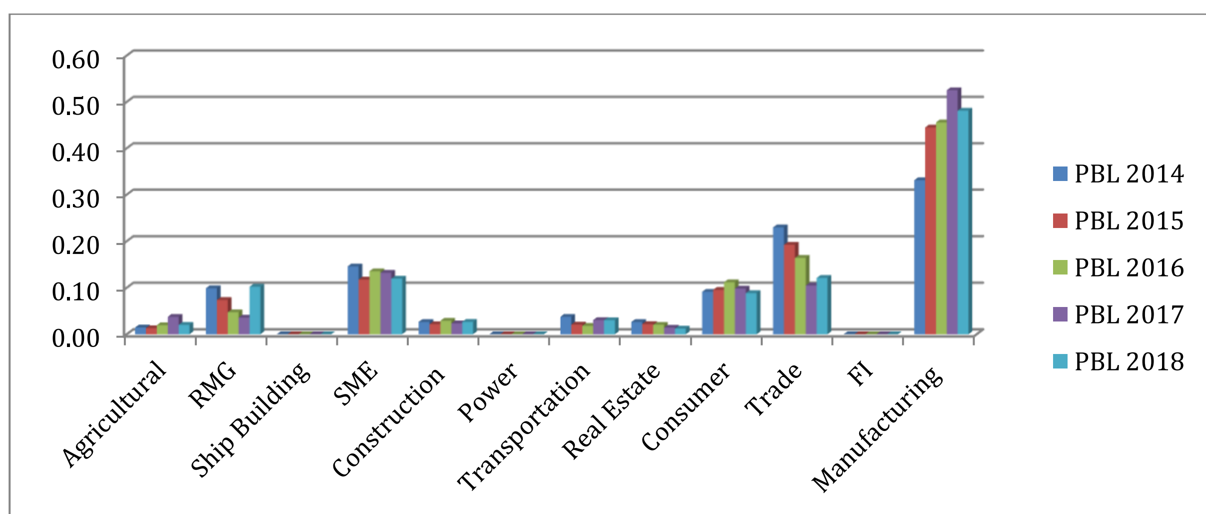

Figure 3: Loan concentration Scenario of PBL (Prime Bank Ltd.) from 2014-2018

PBL is focusing mainly in RMG, SME, consumer, trade and manufacturing sector.

The loan concentration in agricultural sector is around 2%-4% during the period of study. The banks focus in the RMG sector is increasing recently. In 2018 the loan concentration in this sector is 10% whereas in 2017 the concentration in this sector is 4%.

The concentration in the SME sector of PBL is quite stable and the bank is trying to increase its portfolio concentration in this sector. PBL's SME concentration is around 12%-15% during the period of study.

The loan concentration in the concentration sector is around 3% during the period of study. The bank is less focused in the power sector. The concentration in the transportation and real estate sector is around 2%-3% during the period of study.

PBL's consumer financing concentration is around 9%-10% during the period of study. The bank is increasing its focus in consumer finance recently.

PBL's trade finance concentration is showing declining trend. In 2014, the concentration in this sector is 23% whereas it reduced to 12% in 2018. PBL's concentration in the manufacturing industry is showing an uptrend. Its loan concentration in this sector is 33% in 2014 and it increased to 48% in the year 2018.

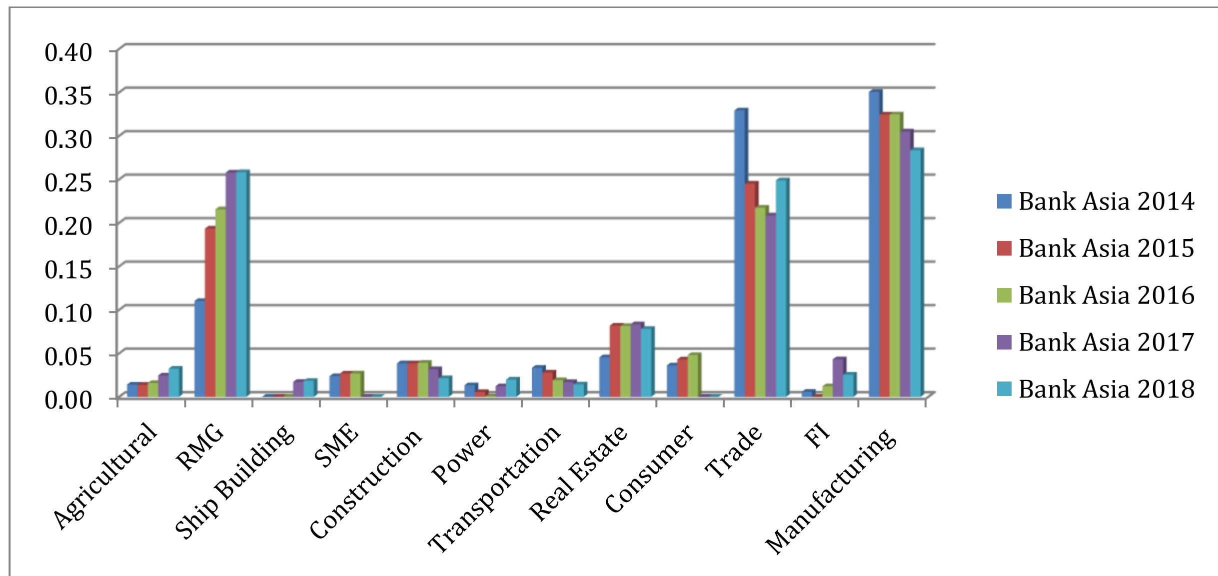

Figure 4: Loan concentration Scenario of Bank Asia Ltd. from 2014-2018

Bank Asia's agricultural concentration is increasing but the concentration is minimal. The loan concentration in agricultural sector is 3% in 2018.

Bank Asia's stake in the RMG sector is showing an upward trend. The concentration in the RMG sector is 26% in year 2018 whereas it is only 11% in the year 2014.

The concentration in the SME sector is only 3% in 2017. The concentration in the construction sector is declining and is only 2% is in 2018. Concentration in the power in power and transportation sector is around 2% lately.

The concentration in the real estate is only 8% during the period of study and concentration in this sector is quite stable.

In consumer financing the banks concentration is around 5%.
Major focus of Bank Asia is in trade finance and manufacturing industry; however, the concentration in the trade finance sector is representing a declining trend. The concentration in this sector is 33% in the year 2014 whereas it reduced to 25% in the year 2018.

The concentration in the manufacturing industry is also showing a downward trend in the past five years. The concentration is 35% in 2014 which reduced to 28% in 2018.

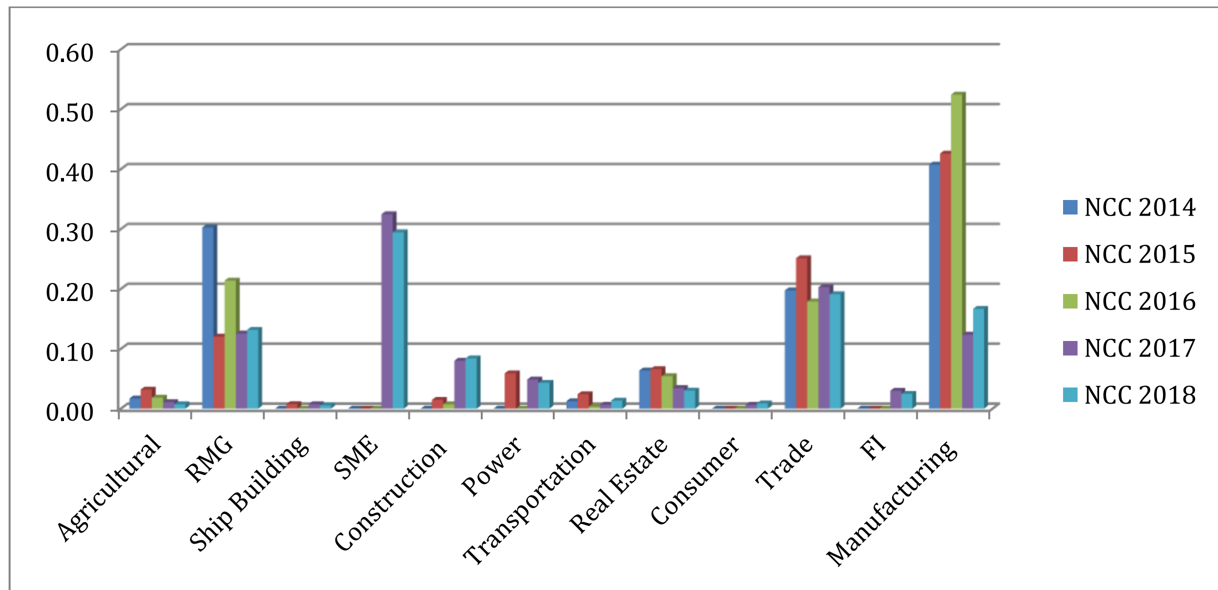

Figure 5: Loan concentration Scenario of NCC Bank Ltd. from 2014-2018

NCC bank's agricultural sector concentration is very minimal. In the year 2018 its concentration in the agricultural sector is barely 1%.

Concentration in the RMG sector is showing a declining trend. The concentration is 30% in 2014 which reduced to 13% in 2014.

The concentration in the SME shows a high rise jump in year 2017 and 2018. The concentration is 32% in 2017 and 29% in 2018.

The concentration in construction sector is 8% in year 2017 and 2018. In power sector the concentration is around 4%-6% during the period of study. In transportation sector the concentration is barely 1% in 2018. In real estate sector the concentration is 7% in year 2015 which reduced to 3% in 2018.

The concentration in the trade finance is stable during the period of study. The concentration is about 20% during the period of study. The highest concentration in this sector is in year 2015 with concertation of 25% in this sector.

NCC bank is highly concentrated in manufacturing industry. However, the concentration drastically falls from 52% to 17% from year 2016 to 2017. In 2014 the concentration in this sector 41% and 17% in 2018.

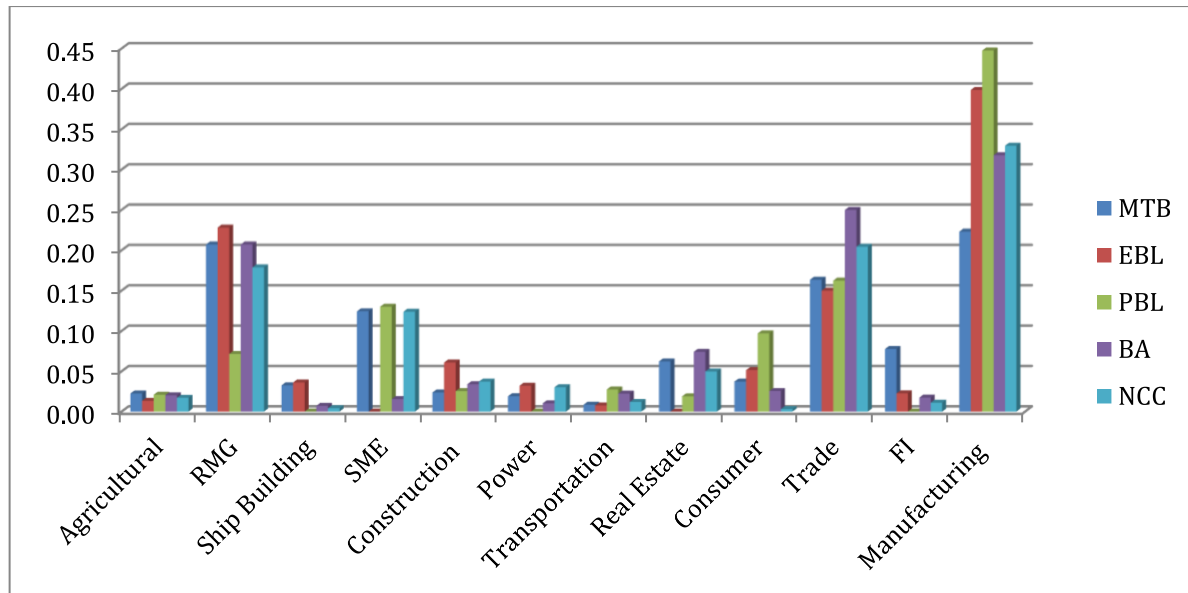

Figure 6: Average loan concentration of selected 5 PCBs (Private Commercial Banks) from 2014-2018

In the figure above we can see that all banks except EBL is providing 2% of their loan portfolio to the agricultural sector. EBL concentration is 1% on average in this sector during the period of study.

In RMG sector EBL has highest concentration on average about 23% of its loan portfolio goes to this sector. The MTB and Bank Asia provide 21% of their loan portfolio on average to RMG sector. PBL and NCC provide 7% and 18% of their loan portfolio on average to RMG sector.

EBL has highest concentration on average on ship building industry among the banks which is only 4% of its total loan portfolio on average during the period of study.

PBL, MTB, and NCC banks have focused concentration on SME business among the five banks. The concertation is 13%, 12% and 12% respectively of their total loan portfolio on average during the period of study.

In construction and power sector EBL has highest concentration among the banks. The average concentration in construction and power sector is 6% and 3% during the period of study. In real estate sector Bank Asia is providing the most among the banks which is 7% of its loan portfolio during the period of study.

In consumer financing PBL is focusing recently very much and the average concentration of PBL in consumer financing is about 10% of its total loan portfolio during the period of study.

In trade finance Bank Asia has the highest concentration among the banks during the period of study. 25% of Bank Asia loan portfolio is concentrated in this sector.

In financing manufacturing industry PBL and EBL have shown highest concentration among the studied five banks their concentration in manufacturing industry is 45% and 40% respectively during the period of study.

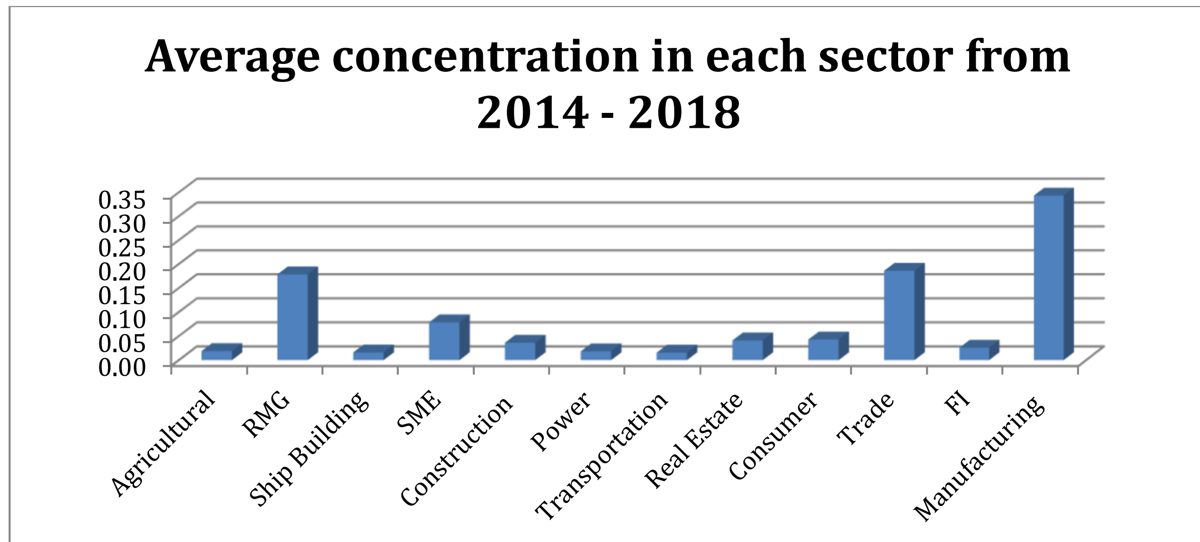

Figure 7: Average concentration in each sector during the period of study (of 5 PCBs studied)

In the figure above, we can see that the average concentration is highest in the manufacturing industry with average concentration around 34% of the total loan portfolio. The average concentration in RMG and trade finance is 18% and 19% respectively. The concentration in SME sector is growing lately around 8% of the total loan portfolio during the period of study.

5. Hypothesis Testing

5.1. The relationship between banks returns and loan portfolio concentration

To test the hypothesis here we considered the variable ROE of the banks as the measurement of the return and to measure concentration we used the Hirshmann-Herfindahl Index (HHI). Here to test this hypothesis panel data is used of five commercial banks for the last five years. In determining the loan concentration's impact on banks return we will use the following hypothesis statements:
H_0: There is no relationship between loan concentration and bank's return
H_1: There is significant relationship between loan concentration and bank's return
The econometric model of this theory is:

$$lnROE_t = \beta_0 + \beta_1 . lnCM_t + \epsilon_t$$

The model includes natural logarithm of ROE as dependent variable and natural logarithm of HHI as independent variable. Here, we used natural logarithm because the data are somewhat skewed positively. Therefore, we used natural logarithm of the variables to make sure the data have normal distribution. The model includes error term which represents the impact of other variables on the dependent variable. The error terms represents the sum of the deviations within the regression line.

Table 1: Regression Statistics of loan concentration on banks' return

Regression Statistics	
Multiple R	0.41
R Square	0.17
Adjusted R Square	0.13
Standard Error	0.28
Observations	25

	β	t Stat	P-value	F	Significance F

Intercept	-2.84	-9.37	0.00	4.73	0.04
CM[1]	-0.45	-2.18	0.04		

The regression statistics above shows that Multiple R is 41% indicating strong relationship between the ROE and concentration measure (HHI). The R-square is 13% which means that 13% change in ROE is explained or caused by the loan concentration. The coefficient value of β_1 is -0.45 that mean for 1 percentage point increase in loan concentration the ROE would be reduced by -0.45 percentage points. This relationship between ROE and loan concentration is significant at 5% significance level (α). This means increase in loan concentration would negatively affect the return of the bank.

5.2. The relationship between banks risk and loan portfolio concentration

To test the hypothesis here we considered the variable NPL of the banks as the measurement of the risk and to measure concentration we used the Hirshmann-Herfindahl Index (HHI).

Here to test this hypothesis panel data is used of five commercial banks for the last five years.

In determining the loan concentration's impact on banks risk we will use the following hypothesis statements:
H_0: There is no relationship between loan concentration and bank's risk
H_1: There is significant relationship between loan concentration and bank's risk

The econometric model of this theory is:

$$lnNPL_t = \beta_0 + \beta_1 . lnCM_t + \epsilon_t$$

The model includes natural logarithm of NPL as dependent variable and natural logarithm of HHI as independent variable. Here, we used natural logarithm because the data are somewhat skewed. Therefore, we used natural logarithm of the variables to make sure the data have normal distribution. The model includes error term which represents the impact of other variables on the dependent variable (NPL). The error terms represents the sum of the deviations within the regression line.

Table 2: Regression Statistics of loan concentration on banks' risk

Regression Statistics	
Multiple R	0.04
R Square	0.0015
Adjusted R Square	-0.04
Standard Error	0.36
Observations	25

	β	**t Stat**	**P-value**	**F**	**Significance F**
Intercept	-3.25	-9.78	0.00	0.03	0.85
CM(HHI)[2]	-0.04	-0.18	0.86		

The regression statistics above shows that Multiple R is only 4% indicating weak relationship between NPL and concentration measure (HHI). The R-square is 0.15% which means that 0.15% change in NPL is explained or caused by the loan concentration which is also insignificant and we cannot deduce anything from this result. The

[1] Concentration measure shows a significant relationship with ROE at 95% confidence level.
[2] Concentration Measure shows insignificant relationship with NPL. The p-value is 86% in this case.

coefficient value of β_1 is -0.04 that means for 1 percentage point increase in loan concentration the NPL would be reduced by -0.04 percentage points. However, this relationship between NPL and loan concentration is insignificant because the P value is 0.86 which is very high. The significance F value is also very high 0.85. Therefore, on the basis of this study we cannot established any form of relationship between NPL and loan concentration. Here, additional data may be required to established relationship between these variables.

6. Findings

a) Bank's return, ROE, and loan concentration is inversely related.
b) Insignificant relationship between loan concentration and NPL.
c) Loan is mainly concentrated in RMG, trade finance and manufacturing industry.
d) Banks are gradually increasing their concentration in SME.

7. Recommendations

a) Banks should diversify their portfolio as it would yield more return for the shareholders' of the banks.
b) More extensive study is required to establish the relation between NPL and loan concentration.
c) Bank should increase its size of portfolio in the SME sector which is a promising sector for an emerging economy.
d) Banks should try to reduce their loan concentration to the optimum level for RMG, trade finance and manufacturing industry.

8. Conclusion

Banking industry in Bangladesh is comparatively structured and regulated. The sector lately is facing serious problem due to increase in high default loan which undermines the profitability of the banking industry. This paper tries to shed some light on the topic of how the loan portfolio concentration in banking industry may impact its NPL and return. The result seems to support the assumption that concentration negatively affects the bank's return. However, the study is unable to establish any type relationship between NPL and loan concentration. To establish this relation there is a need of more extensive study.

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