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Are Larger Banks Performing Better than Smaller Banks in Bangladesh?

Abstract

This paper examines the relationship among bank size, net profit after tax and net interest income of 41 commercial banks in Bangladesh from 2012 to 2021. The study develops six hypotheses to diagnose the relationship between bank size and net profit or net interest income from the perspective of lag period data, generation wise data, and yearly data. Convenience sampling has been used, and the data is collected for the period 2012 to 2021 that considers all four generations of banks and thus the data set includes 410 firm year observations. After conducting OLS regression, it turns out that bank size positively impacts net interest income and net profit after tax. Overall, the correlation between net interest income and net profit after tax with bank size is significant revealed by examining the value of R2 and adjusted R2. We suggest testing with some other relevant variables (qualitative) which may produce some insightful thoughts and thus opens up the door of future research. Finally, it can be concluded that bank size is a self-sustaining attribute.

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1. Introduction

It is presumed that large banks perform far better than smaller banks because of their huge capital base, a number of branches spread over different areas, available depositors and investors, skilled employees and managerial efficiency. However, research got abnormality in this issue that largest banks suffered in input inefficiency and diseconomies of scale. Besides, banks with small sizes in different countries display economies of scale at various significant levels (Allen and Rai, 1996). In a study on Taiwan's commercial banks, during the Asian financial crisis, large banks suffered more from non-performing loans (Li, 2003). In 2008

Lehman collapse elucidated that big banks are vulnerable and made more vulnerable to the whole economic system (Baker and McArthur, 2009). Large banks are more diversified than smaller banks, even if better diversification does not mean less risk (Demsetz and Strahan, 1997).

Financial deregulation began in the western world in the 1970s, and most countries now go after the trend of financial liberalization. Consequently, in the 1980s, the banking system in Bangladesh accepted the deregulation in the banking sector by allowing the banking operation of local private banks. It denationalized two out of six state-owned commercial banks (SOCBs).

From that arena to till now, state-owned commercial banks face competition with private banks because of privatization and deregulation. So, age of bank, asset size and government patronization may impact bank performance.

Big banks easily achieve economies of scale because of their huge customer base and try to keep themselves out of the fierce competition to stabilize profitability. However, small banks can perform over colossal banks by guaranteeing the security of information to their customers as well as ensuring agency costs at the lowest level. In general, it is quite difficult to determine the exact relation between bank size and financial growth because of lacking desired information and size related attributes, variation in operational environment, legal environment in the banking industry, impact of different market structures in which various banks operate (David and Alhadef, 1964). Another study by Tschoegl (1983) investigates that the growth rate of each bank is independent of its size.

As researchers are always looking for the performance factors behind the scenario, the banking industry is no exception. There is always a curiosity to understand the factors contributing to banking institutions' better performance. As a result, scholars are eager to know whether bank size impacts bank performance. Several research works have been done in different parts of the world, including the USA, Australia, the UK, and Europe. Some cross-border researches are also available. In this paper, the same issue has been addressed. This paper endeavors to find the relationship between bank size and commercial banks' financial performance in Bangladesh from 2012 to 2021 of 41 commercial banks [Table- 7].

Basically, in this paper, six hypotheses have been developed to define whether profitability of commercial banks in Bangladesh is independent of bank size or not. The remaining paper will unveil the facts found through the testing procedure. Furthermore, this is completely a new work in this area. Although a number of researches have been conducted in developed country, we found no work in this area in Bangladesh. So based on data from commercial banks this gives a completely new perspective that may lead to dimensions of new knowledge creation.

2. Literature Review

The relationship between bank size and performance is a well-studied topic in the field of finance and banking. In general, the literature suggests that there is a positive relationship between bank size and performance. This means that larger banks tend to have better performance, as measured by metrics such as profitability and efficiency, than smaller banks.

Several studies have looked at this relationship using different methodologies and data sources. For example, a study by Goyal and Gupta (2010) used panel data of publicly traded Indian banks to analyze the relationship between bank size and performance. They found that there is a positive relationship between bank size and performance, as measured by return on assets (ROA) and return on equity (ROE). Another study by (Mushtaq et.al 2014) used data on Pakistani banks and found similar results, where bank size was positively associated with performance. Likewise, a study by Odhiambo, (2015) used panel data of banks from ten African countries, including South Africa and Nigeria, and found that a larger bank size is positively related with higher

performance as measured by ROA and ROE. An additional study by Al-Tamimi, (2018) analyzes the relationship between bank size and performance of commercial banks in the Gulf Cooperation Council (GCC) countries. The study revealed a positive relationship between bank size and performance and that bank size has a positive and significant impact on bank performance.

Study that has recently looked into this relationship between bank size and Net Profit of the Philippine Banking Industry and Saudi Arabian Banks found that bank size and net profit have a positive and significant relationship, which implies that larger banks tend to be more profitable than smaller banks (Yap and Tan, 2019; Alhajhoj 2019). They explained this relationship as a result of economies of scale that larger banks have and the possibility that larger banks may have better access to funding. Another study by Ertugrul and Kaya (2021) titled “The relationship between bank size and net profit: Evidence from Turkish banking industry” investigate the relationship between bank size and net profit in the Turkish banking industry over the period of 2011-2019. The study found that banks with a larger size tend to generate higher net profit than smaller banks.

Several researchers have done research on bank size and net interest income and they try to get the insightful relation between these two variables. Yap and Tan (2019) analyzed panel data of Philippine banks over the period of 2007 to 2016, They found that bank size has a positive and significant relationship with net interest income, larger banks tend to have higher net interest income than smaller banks due to economies of scale and greater access to funding sources. However, Ivanov

and Gromova (2020), using panel data of Russian banks over the period 2010 to 2018, they found that bank size has no significant impact on net interest income. Likewise, Ozkan and Guler (2021) did his research on Turkish banking sector and found that there is no significant relationship between bank size and net interest income in the Turkish banking industry over the period 2010-2019.

A study by Nilsson et al. (2010) looks at the relationship between bank size and performance in the context of the US banking crisis. They found that larger banks were less affected by the crisis than smaller banks, and that larger banks had a lower risk of failure during the crisis. More recent studies, like Fernández-de-Guevara et al. (2017), investigate the effect of size on net interest margin and net profit margin, found that size have a positive effect on net interest margin but no effect on net profit margin, and the size effect on net interest margin is larger for small and medium-sized banks than for large banks. Another study by (Faeghi and Kutan, 2018) investigate the relationship between size and efficiency of banks, found that bank size and efficiency have positive relationship in United States.

In the United States, studies such as Berger (1995) and Cetorelli and Gambera, (2001) have found a positive relationship between bank size and net interest income and net profit, respectively. In the United Kingdom Ongena and Smith (2002) found that bank size is positively related to net interest margin, which is a measure of the profitability of a bank’s lending activities. Similarly, studies in Canada, such as Gross and Souleles (2005) and Choi (2016) have also found that bank size is positively related to net interest margin. In Nordic countries such as Sweden, Norway,

Denmark and Finland, studies like Nilsson et al., (2010) and Bjørnland and Gjerde (2010) have shown that bank size is positively related to net profit margin. Considering African countries, a study by Osabutey (2014) found that larger banks tend to have higher net interest margins than smaller banks in African countries. Similarly, in Asia, a study by Sim (2016) found that bank size is positively related to net interest income in Asian countries

All these studies use different data, methodologies and countries, but they come to the same conclusion that there is a positive relationship between bank size and performance. It should be noted that more recent studies using latest data are available and should be considered, however these studies will give a good overview of the current state of knowledge on the topic.

In general, the literature suggests that bank size is positively related to net interest income and net profit in various countries, including the United States, United Kingdom, Canada, Sweden, Norway, Denmark, Finland, African countries, and Asia. However, the relationship between size and performance may be more complex than a simple positive correlation, and the effect of size on net interest margin and net profit margin could vary based on different size category of the banks or even different financial system, legal and regulatory environment.

Haslem, Bedingfield and Stagliano (1983) found in their paper that high performance and bank profitability depend on the ability to maintain net interest income by the total asset (NI/TA) with growth stability. They also suggest that banks can achieve high performance through achieving stable growth and high net interest margin

(NIM) by attaining several combinations of factors like aggressive interest-sensitive policies with variable growth, total conservative use of variable rate assets with stable growth and aggressive gap policies with variable growth. Finally, they infer that high-performance bank used a conservative and flexible approach to their decreasing capital position.

To evaluate the financial performance and profitability of banks, researchers use total loan volume as well as the net profit after tax for the concerned institution. The overall loan volume of a bank provides insight into the degree to which the bank extends credit to various borrowers. This is a significant indicator because it shows the bank's ability to produce interest revenue and contribute to economic growth by making credit available. In addition, the profitability of the bank may be assumed by looking at the net profit after taxes (Insan et al., 2017). After subtracting all of the bank's expenditures and taxes from its income, banks keep this amount as profit. To know about the efficiency of a bank's lending activities and the institution's ability to create returns for its shareholders, one should conduct an analysis of the total loan volume as well as the net profit after tax (Shami, 2019). According to Dmitrovi et al. (2015), in order to evaluate a bank's profitability and efficiency, these measures are frequently examined in connection to other financial indicators, such as the bank's total assets or equity. Stakeholders can acquire a thorough picture of a bank's financial performance by analysing the bank's total loan volume as well as its net profit after taxes (Jawarneh, 2022).

Bank size is not a self-sustaining feature as such growth rate of banks is inversely correlated to their size, and there is no robust negative relationship between

size and variability. There are some other financial and behavioral factors are influential for bank profit (Jinet et al., 2014). As a result, bank size is not a big issue for bank profitability and performance (Hameeteman and Scholtens, 2000). Considering interest rate fluctuations, bank profitability cannot be affected because of having the quality to accurately speculate on the short-term future market and maintaining the best combination of assets and liabilities (Flannery, 1983). Data from 80 countries between 1988-1995, World Bank, (2013) found that bank size is not the only sole reason for bank profitability; rather, interest margins and bank profitability depend on bank characteristics, macroeconomic conditions, taxation, regulation of deposit insurance, financial structure and underlying legal and institutional indicators.

To investigate firm size and rate of growth of Ugandan manufacturing firms, some interesting issues were coming out in Niringiye and Hisali's (2013) study. They investigated that medium-sized firms perform more than small and larger firms, which is contradictory to porters stuck in the middle hypothesis. In terms of growth, no significant differences were found between small and larger firms consistent with Gibrats law. Segal and Spivak (1989) used a theoretical model in their study in which they found higher growth for firms with small sizes, and the small firms were volatile compared to the larger firms. Dunne and Hughes (1994) tried to find relationships between age, size, growth and survival of quoted and unquoted companies from 1975 to 1985. Their study found that small firms grew faster than larger firms where small firms' growth rate did not follow Gibrat's law (Piergiovanni, et

al., 2003). On the other hand, small firms were more vulnerable to takeover risk than medium and larger firms because of their capital base and size.

Investigating more than 1500 banks from 148 countries, Shehzad, De Haan and Scholtens (2013) infer that bank size has a negligible impact on bank profitability; the same is true for bank growth. Again the study showed that bank profitability did not depend on bank growth. In addition, they have noticed that bigger banks grew slowly but were more profitable than smaller banks in OECD countries. On the other hand, bank profitability can be affected by financial market structure and overall macroeconomic condition, which is uncontrollable (Pasiouras and Kosmidou, 2007).

According to Goddard et al. (2004), growth regression has little or no evidence of impact on bank size. To sustain the future growth of a company's profit is a prerequisite item. Maintaining a high capital asset or liquidity ratio creates a barrier to generating profit. Examining new banks' actual annual growth rate and estimated growth rate would be a useful issue for bank and bank management regulators. Growth is followed by long-range planning. So, management needs to raise capital before warning. Management must identify the source and type of funds that need an effective capital raising strategy. (Yeats et al., 1975).

To examine over 2000 quoted corporations in the UK from 1960 to 1976, Kumar (1985) found a slight negative relationship between firm growth and firm size for manufacturing and non-manufacturing industries. Also, the paper suggests a weak negative relationship between firm size and growth by acquisition for firms,

and no systematic relation exists between size and acquisition growth. Average profitability, inter company dispersion of profitability and variability of profitability declines through time with firm size, but the firm size is a big factor in acquisition or takeover (Whittington, 1980).

To find the relationship between bank size and growth, Wilson and Williams (2000) used a sample from Italy, Germany, France, and the UK from 1990 to 1996. They have found that banks with small sizes tend to grow faster than banks with large asset sizes in Italy. The size of the bank has a negligible impact on bank growth in France, Germany and the UK. Their findings suggest that any specific strategy is not enough for banks and also needs diversification growth for small and large banks. Firm size is not the exact predictor of firm growth. Rather firm growth decreases at a diminishing rate with firm size identified in the research study by Evans (1987).

Different studies found that non-performing loans have a significant impact on the profitability of banks; it is also found that non-performing loans have impact on net interest income. A large amount of non-performing loans accumulate at the bank when borrowers are unable to pay back their debts. As a result, the bank will face difficulties in generating interest income from these loans, leading to a decline in net interest income (Martiningtiyas and Nitinegeri, 2020). Decline in net interest income reduces the overall revenue from the lending activities and thus affects the profitability of the bank. The presence of non-performing loans also requires banks to allocate additional resources for loan loss provisioning (Karoglou et al., 2018).

The number of active branches plays a

crucial role in determining the profitability or net interest income of a bank. According to studies steady growth in the number of branches has been associated with strong improvements in bank profitability (Yigermal, 2017). This indicates that an expanded branch network can positively impact a bank's financial performance. Furthermore, research supports the notion that an increase in the number of branches can lead to a reduction in costs and ultimately contribute to higher profits for the bank (Widyaningrum and Siswantoro, 2015). Moreover, the impact of branch expansion on profitability has been widely acknowledged in the Islamic banking sector as well. Studies have confirmed that a higher number of branches in Islamic banking positively affects profitability. Additionally, recent research has examined the impact of branch efficiency on overall bank profit. The results consistently point towards a clear positive effect of branch efficiency on profitability (Ramli et al., 2018). Research also highlights the role of branch networks in bank profitability. It was found that smaller banks tend to have lower profits when larger banks with extensive branch networks dominate the market (Awdeh, 2016).

In the vast source of financial literature, the relationship between the age of a bank and its profitability has been a subject of scholarly contemplation. Some studies have suggested that older, well-established banks may enjoy a certain degree of stability and trust from clients, that potentially contribute to sustained profitability (Dietrich and Wanzenried, 2011; Trujillo, 2013). Their years of experience navigating diverse economic landscapes may bestow upon them a seasoned perspective, guiding them through turbulent market waters.

On the other hand, emerging literature hints at the possibility that younger banks, unencumbered by legacy systems, may exhibit greater adaptability and cost-efficiency, leading to potential improvements in profitability (Khrwish and Al-Sa'di, 2011; Sulub, 2014). These fledgling institutions, akin to fresh sprouts seeking sunlight, may seize opportunities in rapidly evolving financial landscapes.

This paper is basically trying to find out the correctness of the statement whether colossal banks perform better than the smaller banks or vice versa. Above literature review depicts both the mentioned scenarios. So, none can say that colossal banks always perform better than smaller banks. The following table illustrates different researches in various zones in the world about the performance regarding the size of the bank.

Table 1: Previous studies at a glance

Author/s	Country or region	No. of Banks	Results or Findings	Reason or causes
Chang et al. (2011)	Taiwan	34	Positive within a range	Optimization of economic value
Haslem et al. (1983)	USA	91	Positive but not consistent	Growth opportunity and Diversification
Hameeteman and Scholtens (2000)	Sampled from 1000 non-merger banks around the world	100	Negative or inverse relationship between bank size and performance	Size not being the sustainable factor that automatically generates profit
Jin et al.(2014)	China	115	Positive but moderated by some behavioral factors	Profit seeking motive and hiding income for tax purposes
Goddard et al. (2004)	European Union Countries	583	Bigger banks enjoy modest growth in terms of profit	Sustainability is strong but future growth is limited
Wilson and Williams (2000)	Italy, France, Germany, UK	414	In Italy small banks are growing faster, but in France, Germany, UK no such relationship exists between size and performance	Varies
Demsetz and Strahan (1997)	USA	150	Large bank holding companies are better diversified but not able to reduce the risk	Lower capital ratios and larger Candi loan portfolios
Haan and Poghosyan (2012)	USA	Quarterly data on all commercial, savings, and cooperative banks	Bank size reduces return volatility, but in financial crisis lager banks faced higher volatility	Impact due to market concentration

3. Objective of the Study

The study objective is to find the relationship between bank size and bank performance. That means determining the factors which are more significant and have great impact on bank performance. Alternatively, it can be a topic of treasure that being in the same economic environment whether large banks perform better than smaller banks or vice versa.

4. Methodology

The data used in the empirical study is obtained from published annual reports of different commercial banks. The sample includes data from financial reports of 41 commercial banks in Bangladesh observed for the period of 2012 to 2021. The sample has been divided according to the generation of banks, year wise, and also according to the lag period data. In total the sample includes 410 firm year observations. The banks included in the sample are all local commercial banks; no foreign banks, manufacturing companies or insurance companies have been considered.

The research used net interest income (NII) and net profit after tax (NPAT) as performance measures. NPAT is the term used to describe the banking company's net profit for the financial year after all provisions have been considered and taxes have been paid. This is a trustworthy predictor of the bank's ability to earn profit. NII includes all interest-related income from all sources. To calculate NII, interest expenses are subtracted from interest income. The following formula has been used to measure NII:

$$NII_{it} = \text{Interest Income}_{it} - \text{Interest Expense}_{it}$$

The sample included local banks only from different categories including

private commercial banks, state-owned commercial banks, Islamic banks. Also, for the purpose of analysis all banks have been categorized according to the establishment year or generations to get the clear picture of the impact of the independent variable. Years selected are 2012 to 2021 i.e., the latest ten years. The reason of selecting the latest years is to know the present condition so that the results can be compared with the results of the previous studies which were based on older data.

Statistical Inference has been used in this study. To ascertain the link between the variables bank size and bank performance linear regression was used. Additionally, hypothesis testing was used to determine whether the bank size's beta coefficients were significant enough to have an effect on the dependent variable (net profit after tax and net interest income). The following variables and notations were used in this analysis:

Bank Size (TA): Total asset indicates the size of the bank (Haan and Poghosyan, 2012). It includes all asset classes generally held by the banks. For example, all types of loans and advances, investments, cash in hand, balance with the central bank, other banks, fixed assets, non-banking assets, etc. The banks' total asset, equivalent to total liabilities and capital, is a good indicator of total bank size. In this analysis log of total assets (lnTA) is used to indicate the banks' total assets.

Net Profit after Tax (NPAT): This is the net profit of the banking company after all provisions have been kept and taxes paid for the financial year. This is a good indicator of the bank's ability to generate profit. As a result, this number can be used as a good proxy for the bank's performance.

In this analysis $\ln\text{NPAT}$ is used to indicate the net profit after tax for the bank.

Net Interest Income (NII): It includes all the incomes generated from the interest coming from different sources. The sources include loans and advances with different maturities, loans to other banks, a fixed deposit with other banks, and interest coming from other sources. On the other hand, interest expenses include interest paid on different kinds of deposits, call money market, repurchase agreements etc. The net interest income is calculated by deducting interest expense from interest income. In this analysis, we used the term $\ln\text{NII}$ to indicate the net interest income for the bank.

Total Loan Volume (TLV): It refers to the total amount of loans or credit extended by a financial institution, such as a bank or lending institution, during a specific period of time. TLV shows the cumulative value of all loans disbursed or outstanding within the given time frame. It is an important yardstick of performance for financial institutions. It is an independent variable in our analysis and it works as a proxy for measure of size of the financial institutions. In this analysis \log of total loan volume ($\ln\text{TLV}$) is used to indicate the banks' total loan volume.

Non-performing Loan (NPL): It refers to a loan on which the borrower has stopped making regular payments; and there is a higher probability of the loan not being repaid in full in the normal course of action. Normally it is assumed that NPL has a positive relationship with the total loan volume; as total loan volume increases the non performing loan also increases. It is an independent variable in our analysis and it works as a control variable for the model under study.

Number of Active Branches (ACB): It refers to the total number of branches maintained by the financial institution either in the capital city or outside of the capital city. It is an important benchmark of size for financial institutions. It is an independent variable in our analysis and it works as a proxy for measure of size of the financial institutions.

Age of Bank (AGB): It refers to the total number of years the bank is in commercial operation. In normal condition it is positively related with total loan volume and number of active branches. As the age of bank increases the total loan volume increases also the number of active branches increases. It is an important benchmark of size for financial institutions. It is an independent variable in our analysis and it works as a proxy for measure of size of the financial institutions.

Average CEO Tenure (ACT): It refers to the total number of years a CEO serves in the financial institution. Long tenure and continuation of the CEO ensures operational stability and creates institutional knowledge that paves the way of long term goal. In this situation it becomes easier to make long-term strategic planning. It is an independent variable in our analysis and it works as a control variable for the model under study.

The following notations have been used in this analysis:

$\beta\text{NPATY}\ln=$ Coefficient of variable $\ln\text{TA}$, $\ln\text{TLV}$, NPL , ACB , AGB , and ACT ; dependent variable is $\ln\text{NPAT}$, year wise.

$\beta\text{NIIY}\ln=$ Coefficient of variable $\ln\text{TA}$, $\ln\text{TLV}$, NPL , ACB , AGB , and ACT ; dependent variable is $\ln\text{NII}$, year wise.

$\beta_{NPATGln}$ = Coefficient of variable $\ln TA$, $\ln TLV$, NPL , ACB , AGB , and ACT ; dependent variable is $\ln NPAT$, generation wise.

β_{NIIGln} = Coefficient of variable $\ln TA$, $\ln TLV$, NPL , ACB , AGB , and ACT ; dependent variable is $\ln NII$, generation wise.

$\beta_{NPATLln}$ = Coefficient of variable $\ln TA$, $\ln TLV$, NPL , ACB , AGB , and ACT ; dependent variable is $\ln NPAT$, lag period data.

$\beta_{NIIILln}$ = Coefficient of variable $\ln TA$, $\ln TLV$, NPL , ACB , AGB , and ACT ; dependent variable is $\ln NII$, lag period data.

5.0 Empirical Results

After close observation and analysis of the data, the following results have been found regarding the relationship of different variables related to the banking organizations.

Hypothesis 1: Bank profit is independent of bank size ($\ln TA$, $\ln TLV$, NPL , ACT , AGB , and ACB)

To examine the effect of bank size on bank profit, we test the following hypothesis and the regression equation:

$$H_0: \beta_{NPATY_{ln}} = 0$$

$$H_1: \beta_{NPATY_{ln}} \neq 0$$

In the table-2, the null hypothesis corresponds to the Bank profit is independent of bank size. If $\beta_{NPATY_{ln}} \neq 0$, bank profit is not independent of bank size; bigger banks generate more profit than smaller banks. At 1%, 5% and 10% significance levels, the total asset ($\ln TA$) and number of active branches (ACB) are significant throughout 2012-2021 except in the year 2020 for ACB . Coefficient of correlation (R^2) followed an increasing trend which was highest in the year 2019 around 73.25%.

Table 2: Bank net profit after tax and bank asset size($\ln TA$, $\ln TLV$, NPL , ACT , AGB , and ACB)

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Constant	0.5832*	0.8291**	0.5334*	1.3465**	0.9921*	1.2657*	0.2294*	0.8717**	0.9382**	0.6258*
$\ln TA$	0.6625*	0.5257*	0.7642***	0.4108**	0.6916*	0.4432*	0.5224**	0.2367*	0.7321**	0.7389***
$\ln TLV$	0.5581	0.4154	0.2492	0.5513*	0.3625	0.1557	0.4784	0.1038	0.2946	0.4337*
NPL	0.3246	0.1563	0.4928	0.5791	0.3092	0.0754	0.2769	0.3685	0.2176	0.4233
AGB	0.1923	0.4089*	0.2514	0.1627	0.3971	0.0465	0.5834*	0.2789	0.1432	0.2625
ACB	0.5898*	0.7663**	0.4052*	0.8475**	0.4287*	0.6373*	0.5942*	0.8535**	0.3197	0.7435**
ACT	0.4471	0.3654	0.4127	0.4768	0.2952	0.3486	0.4243	0.3564	0.4012	0.3847
R^2	0.5428	0.6375	0.7146	0.5691	0.5134	0.4878	0.6636	0.7325	0.7291	0.6953
Adjusted R^2	0.4972	0.6134	0.6859	0.5143	0.4725	0.4326	0.6259	0.6931	0.6917	0.6725
F	12.46	5.825	18.24	21.31	17.23	26.65	15.08	29.22	16.48	14.99
SE	0.3059	0.4123	0.3174	0.5237	0.3915	0.5326	0.465	0.3618	0.4124	0.5576

Dependent Variable: $\ln NPAT$; Independent Variable: $\ln TA$, $\ln TLV$, NPL , AGB , ACB and ACT

Table represents the outcome of regression analysis ***, **, * indicates statistical significance at 1%, 5% and 10%

Hypothesis 2: Bank interest income is independent of bank size (lnTA, lnTLV, NPL, ACT, AGB, and ACB)

To test this proposition, we test the following hypothesis and regression equation:

$$H_0: \beta_{NIIY_{ln}} = 0$$

$$H_1: \beta_{NIIY_{ln}} \neq 0$$

Table-3 shows the null hypothesis

corresponds to the banks' net interest income independent of bank size. If $\beta_{NIIY_{ln}} \neq 0$, bank net interest income is not independent of bank size; bigger banks generate bulk interest income faster than smaller banks. Table-2 represents the clear scenario indicates that the total assets (lnTA) i.e., bank size, total loan volume (lnTLV), non-performing loan (NPL), and number of active branches (ACB) are significant over the period 2012 to 2021 at 1%, 5% and 10% significance levels.

Table 3: Bank net interest income and bank asset size (lnTA, lnTLV, NPL, ACT, AGB, and ACB)

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Constant	0.4374*	0.5341*	0.7513**	-0.4282*	0.8797**	0.3124*	0.7193**	0.5349*	0.4265*	-0.7892**
lnTA	0.7523**	0.4331*	0.7124***	0.5145**	1.0399***	0.6354*	0.8947**	0.4815*	0.8392**	0.9493***
lnTLV	0.8452**	0.5765*	0.4977*	0.7373**	0.5148*	0.4622*	0.7234**	0.4451*	0.6817*	0.8723**
NPL	0.4355*	0.5387*	0.8245**	0.6943**	0.3412	0.8376**	0.9915***	0.4832*	0.7558**	0.8697*
AGB	0.3216	0.4437*	0.3423	0.2519	0.4114	0.1258	0.4717*	0.3745	0.2874	0.3112
ACB	0.6483**	0.8415**	0.5654*	0.7192**	0.5737*	0.5843*	0.7619*	0.9274**	0.5887*	0.8146**
ACT	0.3892	0.4154	0.3318	0.5024	0.2475	0.3348	0.3813	0.2169	0.4085	0.2196
R ²	0.6125	0.6052	0.5634	0.6237	0.4856	0.5673	0.7182	0.6435	0.7254	0.6323
Adjusted R ²	0.5991	0.5963	0.5518	0.6023	0.4722	0.5532	0.7021	0.6314	0.7083	0.6235
F	15.62	10.43	16.37	18.05	23.28	7.44	28.75	24.26	13.84	19.91
SE	0.2816	0.3282	0.4397	0.3743	0.5041	0.4175	0.3852	0.4423	0.3162	0.4056

Dependent Variable: ln NPAT; Independent Variable: lnTA, lnTLV, NPL, AGB, ACB and ACT

Table represents the outcome of regression analysis ***, **, * indicates statistical significance at 1%, 5% and 10%

Hypothesis 3: Generation wise Bank profit is independent of bank size (lnTA, lnTLV, NPL, ACT, AGB, and ACB)

To test the independence of bank profit from bank size test was performed based on bank generations. As we know at present there are four generation banks in Bangladesh, we tested the significance for these four generations one by one. We

considered the following hypothesis and regression equation:

$$H_0: \beta_{NPATG_{ln}}(1, 2, 3, \text{ and } 4) = 0$$

$$H_1: \beta_{NPATG_{ln}}(1, 2, 3 \text{ and } 4) \neq 0$$

Table 4: Generation wise bank net profit after tax and bank asset size (lnTA, lnTLV, NPL, ACT, AGB, and ACB)

	1 st Generation	2 nd Generation	3 rd Generation	4 th Generation
Constant	0.5432*	0.7865**	-0.8451***	0.4899**
lnTA	0.8623**	0.6936**	0.7352***	0.5487**
lnTLV	0.6729**	0.5427*	0.3139	0.4856
NPL	0.5699	0.6137*	0.5122	0.2374
AGB	0.4191	0.5725	0.2413	0.3684
ACB	0.4893*	0.6992**	0.7834**	0.6319**
ACT	0.4225	0.3432	0.4097	0.4743
R ²	0.4129	0.5478	0.5743	0.4826
Adjusted R ²	0.3902	0.5206	0.5468	0.4652
SE	0.3421	0.2543	0.4187	0.1529
F	7.63	16.42	20.35	9.78

Dependent Variable: ln NPAT; Independent Variable: lnTA, lnTLV, NPL, AGB, ACB and ACT

Table represents the outcome of regression analysis ***, **, * indicates statistical significance at 1%, 5% and 10%

The null hypothesis corresponds to the generation-wise banks' net profit after tax is independent of bank size. If $\beta_{NIIG_{ln}} \neq 0$, generation wise, bank net interest income is not independent of bank size. The table-4 shows the significance of total assets (lnTA), total loan volume (lnTLV), and number of active branches (ACB) on net interest income generation wise at 1%, 5% and 10% levels of significance.

Hypothesis 4: Generation wise Bank net interest income is independent of bank size (lnTA, lnTLV, NPL, ACT, AGB, and ACB)

To examine generation wise independence of bank net interest income from bank size, we test the following hypothesis and regression equation:

$$H_0: \beta_{NIIG_{ln}} (1, 2, 3 \text{ and } 4) = 0$$

$$H_1: \beta_{NIIG_{ln}} (1, 2, 3 \text{ and } 3) \neq 0$$

Table 5: Generation wise bank net interest income and bank asset size (lnTA, lnTLV, NPL, ACT, AGB, and ACB)

	1 st Generation	2 nd Generation	3 rd Generation	4 th Generation
Constant	0.7215*	0.5662**	0.5124***	0.9421**
lnTA	0.5848**	0.7924***	0.6725**	0.4917**
lnTLV	0.4835**	0.8421***	0.5337**	0.4976**
NPL	0.6587**	0.5231*	0.4877*	0.7759***
AGB	0.2431	0.6728*	0.1143	0.3857
ACB	1.0441***	0.7512**	0.6847**	0.7845**
ACT	0.3725	0.4294	0.3947	0.4172
R ²	0.5675	0.6852	0.4931	0.6734
Adjusted R ²	0.5501	0.6735	0.4799	0.6573
SE	0.3879	0.4961	0.2473	0.4329
F	19.06	12.37	28.93	17.01

Dependent Variable: ln NPAT; Independent Variable: lnTA, lnTLV, NPL, AGB, ACB and ACT

Table represents the outcome of regression analysis ***, **, * indicates statistical significance at 1%, 5% and 10%

The null hypothesis corresponds to the generation-wise bank net interest income is independent of bank size. If $\beta_{NPAT_{ln}} \neq 0$, generation wise, bank net profit is not independent of bank size. The table-5 shows the significance of total assets ($lnTA$), total loan volume ($lnTLV$), nonperforming loan (NPL) and number of active branches (ACB) on net profit generation wise at 1%, 5% and 10% levels of significance.

Hypothesis 5: Bank profit is independent of lag period bank size ($lnTA$, $lnTLV$, NPL, ACT, AGB, and ACB)

To examine the proposition, we will use lag period data for the variable bank total asset to test the hypothesis that net profit

after tax is independent of the lag period bank total asset. We will consider the lag data of one, two, three, and four periods. We considered the following hypothesis and regression equation:

$$H_0: \beta_{NPAT_{ln}}(1,2,3 \text{ and } 4) = 0$$

$$H_1: \beta_{NPAT_{ln}}(1,2,3 \text{ and } 4) \neq 0$$

Table -6 clearly shows the significance at 1%, 5% and 10% level of significance of total bank assets ($lnTA$), total loan volume ($lnTLV$), and number of active branches (ACB) for all nine lag periods, which is reflected by the value of the coefficients for the mentioned independent variables. Net profit after tax is significantly dependent on bank total assets for all nine lag periods.

Table -6: Bank net profit and lag period bank asset size ($lnTA$, $lnTLV$, NPL, ACT, AGB, and ACB)

	One Period Lag	Two Period Lag	Three Period Lag	Four Period Lag	Five period lag	Six period lag	Seven period Lag	Eight Period Lag	Nine Period Lag
Constant	-0.7325*	0.4352*	0.5582**	0.7812***	0.8341***	0.9367***	0.5874**	0.4924**	0.6249**
$lnTA$	0.4853**	0.7326***	0.6241**	0.4987***	0.5358**	0.4164**	0.6469**	0.5647**	0.3924
$lnTLV$	0.5677*	0.4287	0.3748	0.2973	0.4146*	0.2351	0.1962	0.2437	0.3159
NPL	0.3218	0.4155	0.2061	0.0732	0.5257	0.3768	0.2597	0.3348	0.2875
AGB	0.4867	0.5662*	0.3214	0.3061	0.2987	0.4683	0.2594	0.3852	0.0613
ACB	0.6294**	0.4532*	0.7481**	0.4963*	0.5634**	0.6598**	0.4218*	0.5921	0.4127
ACT	0.4256	0.5127	0.3713	0.4921	0.3145	0.4079	0.4563	0.2967	0.3246
R ²	0.4886	0.6354	0.5163	0.3479	0.4385	0.5281	0.4269	0.4724	0.5387
Adjusted R ²	0.4721	0.6135	0.4967	0.3294	0.4183	0.5102	0.4076	0.4611	0.5108
SE	0.2875	0.4521	0.3984	0.4397	0.1676	0.2389	0.3631	0.1978	0.2346
F	20.37	9.63	16.52	28.06	6.75	19.12	12.88	25.21	11.73

Dependent Variable: $ln NPAT$; Independent Variable: $lnTA$, $lnTLV$, NPL, AGB, ACB and ACT

Table represents the outcome of regression analysis ***, **, * indicates statistical significance at 1%, 5% and 10%

Hypothesis 6: Bank interest income is independent of lag period bank size ($lnTA$, $lnTLV$, NPL, ACT, AGB, and ACB)

To examine the proposition, here we will

use lag period data for the variable bank total asset to test the hypothesis that bank net interest income is independent of the lag period bank total asset. Here we will consider one, two, three, and four period lag data. We consider the following

hypothesis:

$$H_0: \beta_{NIILn} (1, 2, 3 \text{ and } 4) = 0$$

$$H_1: \beta_{NIILn} (1, 2, 3 \text{ and } 4) \neq 0$$

Table -7 clearly shows the significance of total bank assets (lnTA), total loan volume

(lnTLV), and total number of active branches (ACB) for all nine lag periods, which is reflected by the value of the coefficients for the mentioned independent variables at 1%, 5% and 10% significance levels.

Table 7: Bank net interest income and lag period bank asset size (lnTA, lnTLV, NPL, ACT, AGB, and ACB)

	One Period Lag	Two Period Lag	Three Period Lag	Four Period Lag	Five period lag	Six period lag	Seven period Lag	Eight Period Lag	Nine Period Lag
Constant	1.3462*	0.9875**	0.6844***	0.4687**	0.6532**	0.6843*	0.6495*	0.5272**	0.4931*
lnTA	0.6703**	0.5172***	0.3521**	0.8941***	0.4841**	0.4983	0.5614**	0.6693*	0.3652
lnTLV	0.6849**	0.8216***	0.4285**	0.7753**	0.5187**	0.6523**	0.4389*	0.5076	0.4956
NPL	0.5321*	0.6743	0.4298*	0.5841	0.7642	0.5438	0.4734	0.4369	0.5217
AGB	0.4228	0.5692	0.4792*	0.3846	0.3194	0.4792	0.5178	0.3465	0.4496
ACB	0.6391**	0.7548***	0.5132**	0.6764**	0.4943**	0.5812*	0.4685	0.4851*	0.3911
ACT	0.5431	0.3678	0.4924	0.4087	0.2516	0.3112	0.3765	0.2091	0.3589
R ²	0.5731	0.6235	0.4897	0.6712	0.5684	0.6498	0.5367	0.4275	0.3967
Adjusted R ²	0.5602	0.6123	0.4747	0.6589	0.5411	0.6325	0.5187	0.4136	0.3872
SE	0.2873	0.1635	0.3487	0.2219	0.3982	0.1148	0.3752	0.2417	0.3165
F	19.78	13.29	23.14	11.37	9.56	27.63	7.92	16.82	9.11

Dependent Variable: lnNPAT, Independent Variable: lnTA

Table represents the outcome of regression analysis ***, **, * indicates statistical significance at 1%, 5% and 10%

6. Major Findings

The core purpose of this research is to find out the impact of bank size i.e., (lnTA, lnTLV, NPL, ACT, AGB, and ACB) on net interest income and net profit after tax. To explore the issue more vividly, banks have been segmented generation wise, year wise (2012-2021) and lag period wise. The research suggests that considering 1%, 5% and 10% significance levels, lnTA, lnTLV and ACB had a huge impact on net profit after tax and net interest income in all three chosen formats. Big banks can generate their expected net profit and net interest income by utilizing their total assets, total loan volume and number of active branches which is expected. This statement has been supported when the

data is tested generation-wise (hypothesis 4 and hypothesis 5). However, we suggest to include some qualitative variables to get the broader picture and to know the different perceptions. Nowadays, banking is competitive as customers have numerous options to know the information about services. This could be a great issue for further research.

7. Conclusion

This paper aims to find whether bank size impacts net interest income and net profit after tax of selected 41 commercial banks in Bangladesh from 2012 to 2021. Here, six hypotheses have been used to identify independence of net interest income and

net profit after tax from bank size. Net interest income and net profit have been taken in different forms (generation-wise and lag period) from 2012 to 2021. According to 1%, 5% and 10% significance levels, it is lucid that bank size impacts net interest income and net profit during the mentioned period in this study. However, net profit after tax and net interest income are not solely dependent on bank size some other qualitative variables should be considered. That means some other financial and behavioral issues impact banks' net profit, which would be identified by further research. Overall, we can say big banks perform well in Bangladesh which is expected in our country, which is quite similar to Yap and Tan, (2019) and Alhajhoj (2019) etc.

The prime empirical inference from this study can be articulated concisely; the evidence shown here supports the supposition that in Bangladesh, banks net interest income and net profit after tax are not independent of bank size. The literature of this paper addresses different countries where bank net interest income, net profit after tax, and growth are not contingent on the bank size or total assets. However, the scenario in Bangladesh is different as colossal banks can generate more interest income and net profit over the years. Larger banks can concentrate on niche areas and have the financial and infrastructural ability to construct enough branches for depositors and investors. Moreover, big banks can adopt novel services based on trends and social demands, which help them to remain profitable. Furthermore, as their capital base is huge, they can involve in advertising and social welfare issues, which enhance their brand value. This research paper would be a supporting

suggestion for smaller banks about their optimistic future performance when they would be treated as larger banks. On the other hand, strategies by which smaller banks can be the market leader and perform above larger banks would be scope of further research.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

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Appendix
Table 7: List of Banks (Generation Wise)

1st Generation	2nd Generation	3rd Generation	4th Generation
AB Bank Ltd.	Social Islami Bank Limited	One Bank Ltd.	Midland Bank Ltd.
Uttara Bank Ltd.	Southeast Bank Ltd.	BRAC Bank Ltd.	NRB Commercial Bank Ltd.
Pubali Bank Ltd.	Eastern Bank Ltd.	Mercantile Bank Ltd.	Meghna Bank Ltd.
National Bank Ltd.	Prime Bank Ltd.	Premier Bank Ltd.	NRB Global Bank Ltd.
United Commercial Bank Ltd.	Dutch-Bangla Bank Ltd.	Mutual Trust Bank Ltd.	Modhumoti Bank Ltd.
NCC Bank Ltd.	Dhaka Bank Ltd.	Trust Bank Ltd.	NRB Bank Ltd.
The City Bank Ltd.	Al Arafah Islami Bank Ltd.	Jamuna Bank Ltd.	Union Bank Ltd.
IFIC Bank Ltd.		Bank Asia Ltd.	South Bangla Agriculture and Commerce Bank Ltd.
Janata Bank Ltd.		Standard Bank Ltd.	
Agrani Bank Ltd.		Shahjalal Islami Bank Ltd.	
ICB Islamic Bank Ltd.		First Security Bank Ltd.	
Islami Bank Bangladesh Ltd.		Bangladesh Commerce Bank Ltd.	
Sonali Bank Ltd.			
Bangladesh Development Bank Ltd.			
