



Drivers of intermediation costs, financial repression and stability

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Abstract

Attempt to reduce interest rate artificially by setting a ceiling often restricts banks to pass on the intermediation costs to the borrowers which negatively affects bank lending, profitability and consequently, financial stability. In this context, the accounting decomposition of the net interest margin (NIM) for Bangladesh reveals that domestic banks' after-tax profit margins range from negative to moderately positive, whereas, foreign banks retain substantially high profit margins. The higher costs of domestic banks are driven by their business model and stock of non-performing loans in their balance sheets. With net operating expenses and provisioning costs being the two biggest components of NIM, automation and structural reform can reduce intermediation costs, rather than repressive policy (e.g. ceiling) with potential unintended consequences.

Keywords Banks · Net interest margin · Credit interest rate ceiling · Financial stability

JEL Classification E51 · E58 · E63 · G21

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1 Introduction

Lower intermediation cost is an outcome of efficient financial service delivery in a competitive financial environment. Banks' ability to channeling funds from units of surplus to units of deficits in a low-cost way is critical for economic growth and development. The extent to which a country utilises its banking intermediation is a causal factor in economic performance (for example, Levine 2005), poverty reduction (Beck et al. 2007) and reduced inequality (Demirgüç-Kunt and Levine 2009). If intermediation costs are high, a lower level of credit will be channeled to the borrowers. In a country like Bangladesh where capital market is nascent, the intermediation role of banks becomes more critical as alternative source for long-term finance is scarce. The increased demand for finance arising from high economic growth has to be satisfied by banks until the capital market takes its desired role of long-term finance provider.

Higher costs of bank intermediation can arise either due to lack of competition in the market or structural issues such as inefficient operational structure, non-performing assets or volatile macroeconomic conditions. High costs are often associated with credit rationing for the borrowers (Stiglitz and Weiss 1981) or interventionist policies such as interest rate caps that may have unintended negative consequences. Bangladesh Bank (the central bank of Bangladesh) has fixed the lending interest rate ceiling at nine percent since April 2020 after a moral suasion for a while perceiving the lending rate too high. Low cost of bank fund is important to reduce production costs in emerging economies like Bangladesh with high growth ambition but with a nascent capital market. However, instead of addressing the factors responsible for high costs, fixing the interest rate arbitrarily may be counterproductive and unsustainable. If after tax profit margin is not high, then structural issues can be responsible for high margin in the lending rate. Regulatory pressure, such as a regulatory cap, in such situation is unlikely to solve the 'perceived' high interest rate problem and may create threat to financial stability.

Rahman et al. (2019) conduct a study on the plausibility of a single digit lending rate in Bangladesh. They find that except foreign banks, minimum possible lending rate at which business is viable is above nine percent for all other bank categories. So, an accounting decomposition of the interest margin can provide insights whether net after tax profits or other components of costs are large constituent part of net interest margin. This in turn will indicate whether ceiling on lending at nine percent is viable. However, no such analysis is conducted for Bangladesh yet. This has become more important after the issuance of directive on interest rate ceiling for the already fragile financial sector of Bangladesh due to high non-performing loans and poor corporate governance.

Ho and Saunders (1981), in their seminal work, model banks as mere intermediaries and spreads depend on four basic financial components: (1) degree of bank's risk aversion (2) degree of competition in the bank industry (3) average transaction size and (4) interest rate risk. In subsequent literature, this model is extended to incorporate other factors explaining net interest margin. For example, money market rates by McShane and Sharpe (1985), credit risk and its interaction with interest rate

risks by Angbazo (1997) and operating costs by Maudos et al. (2004). Empirically, in addition to bank specific factors, macroeconomic such as inflation (e.g. Demirgüç-Kunt et al. 2004, Claeys and Vennet (2008)) and institutional (Gelos 2006; Poghosyan 2013) factors such as quality of legal set up are considered as determinants of intermediation spreads.

In this context, it is of interest to understand the components and driving forces of intermediation spread in Bangladesh through an accounting decomposition and an econometric estimation of the model of determinants of the net interest margin. Results will reflect on whether the intermediation cost is driven by excessive profit-seeking and uncompetitive behavior or structural issues such as inefficiency. The findings are expected to benefit the policymakers by identifying areas for intervention to reduce intermediation costs while not compromising the financial stability. For example, the study will provide insights on the relevance of lending rate cap policy versus indirect measures targeting operating efficiency and non-performing loans (NPLs) management for reducing borrowing costs. In addition, insights will be provided in the context of state-ownership in financial sector through bank categories-wise analysis.

This paper, therefore, fills the gap in the existing literature by analyzing intermediation costs in Bangladesh to reflect on the areas of priority that can improve efficiency and reduce bank intermediation costs and highlight the risks of financial repression. The analysis is based on bank level panel data of bi-annual frequency for the period 2015–2020. The contribution of the paper is empirical. The case of Bangladesh is particularly interesting as Bangladesh is one of the highest NPLs countries with inadequate provisioning and capital adequacy ratio barely meeting the international standards. Although the financial sector is vulnerable, authorities are dictating for lending interest rate cap. If the higher lending rates are not driven by excessive profit seeking behavior rather reflect the structural inefficiency, then arbitrary rate fixing can be dangerous for financial stability. Interest rate cap limits banks' risk pricing and makes averse to lending. This deprives borrowers from bank loans and reduces banks' profitability and capacity to strengthen capital position. In brief the study finds that operational inefficiency is the biggest factor underlying high costs and domestic banks' after-tax profit margins is moderate suggesting room for automation and structural restructuring.

The rest of the paper is organized as follows: empirical evidence on financial repressions and their consequences are discussed in Sect. 2. Data and methodology to study the driving forces of net interest margin (NIM) are described in Sect. 3. Next, Sect. 4 presents the accounting decomposition of NIM and Sect. 5 presents the results of regression analysis. Finally, Sect. 6 concludes the study with policy recommendations.

2 Financial repression

During the wave of financial liberalization worldwide in 1990s, Bangladesh liberalized interest rate and, except for priority sectors such as agriculture and small and medium enterprise (SME), removed quantitative restrictions. However,

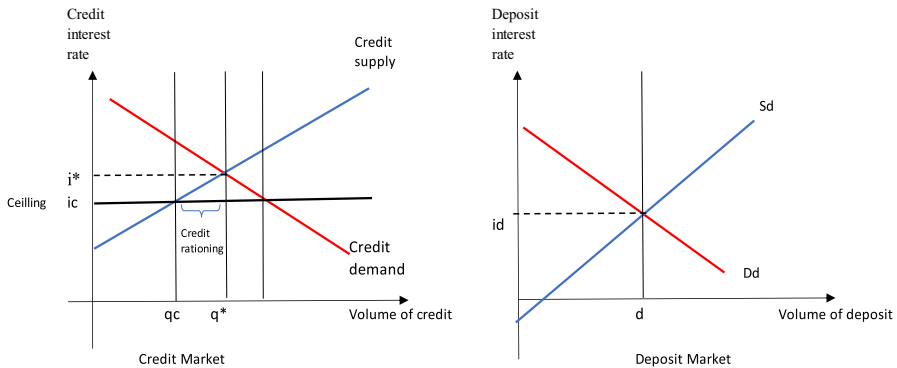


Fig. 1 Financial repression: interest rate ceiling

policymakers, with strong influence of political economy, again resorted to financial repression in 2020 by setting the lending interest rate to a maximum of nine percent, except credit card lending, with a view to support industrial growth. Financial repression can take many forms such as, interest rate controls (ceilings on lending rates and floors for deposit rates), directed lending, restricting capital account for international transactions, and regulatory barriers to bank entry. Two prominent forms of repression in Bangladesh at present are binding interest rate ceiling (and soft floor for deposit rate) and restrictions in capital account transactions.

Views on financial repression have evolved over time. Market failure (Stiglitz 1989, 1993) and information frictions (Espinosa-Vega and Smith 2001) are well established theoretical arguments in favor of government intervention which is thought to be more useful when combined with industrial policy (Yülek 1997). Keynesian view on effectiveness of government intervention, emerged during wartime, implied government as an ‘impartial referee’ who can ensure smooth functioning of market without changing equilibrium allocation function. After the global financial crisis 2008–09, the New Keynesian view was rekindled that role of government is essential to prevent imbalances that destroy stability through regulations.

Financial repression in the form of lending rate ceiling is portrayed in Fig. 1. In the credit market, if we assume banks play only pure intermediation roles, then i^* is the lending interest rate at which credit market clears and borrowers enjoy q^* amount of credit. Now if an arbitrary interest rate below i^* is set, then demand for loans will be higher than the supply of loanable funds. If i^c is the mandatory ceiling for lending rates, there will be credit rationing and the market gets less credit by an amount $q^c - q^*$ in the figure. If the prevailing lending rate is higher than an efficient level (i^*) due to lack of competition and greed of bankers, or information friction then imposing ceiling may bring better allocation of funds.

Passing the costs of repression over to the depositors by lowering the deposit rate is one obvious way for banks to respond but it is difficult in Bangladesh as there are parallel government savings instruments that offer higher returns. In fact, deposit rates are already far below the national saving certificate rates, challenging the deposit collection. Another alternative way is to absorb the pressure by lowering

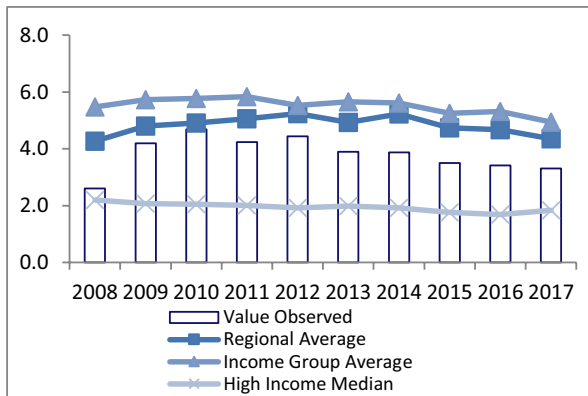


Fig. 2 NIM: Bangladesh and peer group, %. Source: Finstat database (2019). Value observed is for Bangladesh

banks' own profit margin if banks earn moderate to high level profits with capital adequacy. The second way would support the hypothesis that loan interest rate is too high due to excessive profit seeking behavior by commercial banks. However, if the net interest margin mainly consists of costs components rather than profits, then it is harder for banks to implement the ceiling without negatively affecting capital adequacy. Credit rationing is an obvious outcome in this situation.

Perceived 'high lending rate due to excessive greed of the bankers' is one of the main arguments behind market intervention to set lending rate cap. However, such policies are not sustainable in the long run. Jafarov et al. (2019) show that interest rate controls can reduce output growth by 0.4–0.7 percentage points through efficiency and redistribution distortions, such as: (i) compressing returns to savers and leading savings to a suboptimal level; (ii) weakening price signals and distorting the allocation of investment; and (iii) encouraging rent seeking among fewer beneficiary borrowers at the expense of depositors.

Ferrari et al. (2018) show that interest rate caps in lower middle-income countries aim to change the price of credit, while in high-income countries to prevent usury and protect vulnerable consumers. Given the unintended consequences, measures to reduce borrowing costs should be based on knowledge about the banks' cost components rather than imposing arbitrary lending rate ceiling.

The net interest margin of Bangladesh is below the South Asian average (Figs. 2 and 3), which, however, is not a confirmation of greater efficiency of the bank industry. The share of overhead cost, which is the biggest part of NIM, is higher than the South Asian average but below the income group average (Fig. 4). Although the NPL ratio is high, Bangladesh's provision maintenance is inadequate and lower than the South Asian peers. This is an indication of weaker resilience of Bangladesh's bank industry. The non-interest income (fee based income) is also not higher than the levels in regional countries and income group average (Fig. 5). Fixing the interest level may exacerbate the already existing vulnerabilities of the financial sector. The ultimate result may not be supportive to growth rather can have an

Fig. 3 NIM of Bangladesh: bank category-wise, %. Source: Authors' calculation from Bangladesh Bank data

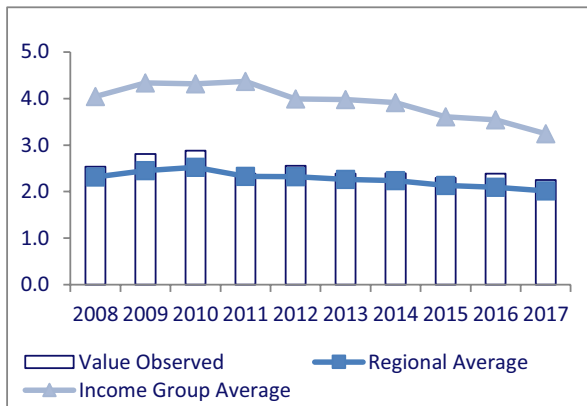
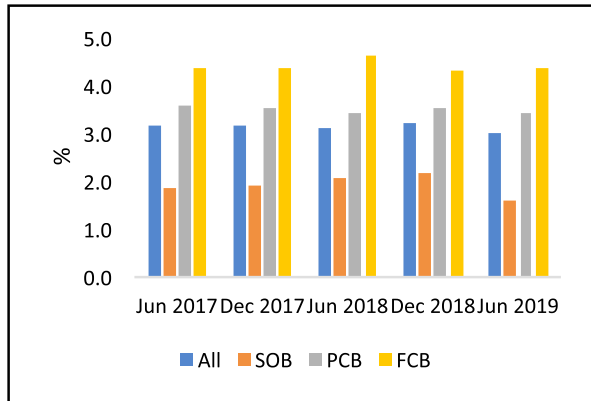


Fig. 4 Overhead costs/Total assets: Bangladesh and peer group, %. Source: Finstat database (2019). Value observed is for Bangladesh

unintended drag on output. Empirical experience, therefore, suggests market-based ways to reduce intermediation costs are more desirable for which we need to know the determinants and components of intermediation spread in Bangladesh.

3 Data and methodology

Net interest margin (NIM) is considered as the measure of intermediation costs throughout the study. The cost of financial intermediation can be measured ex-ante (spread) and ex-post (net interest margin), the latter adopted in this study following Calice and Zhou (2018) as it provides deeper insights on the underlying drivers. The interest spread, which is an ex-ante measure, is the difference between contractual rates charged on borrowers and paid to depositors. In contrary, the NIM is the ex-post measure of intermediation costs, which is the difference between the actual

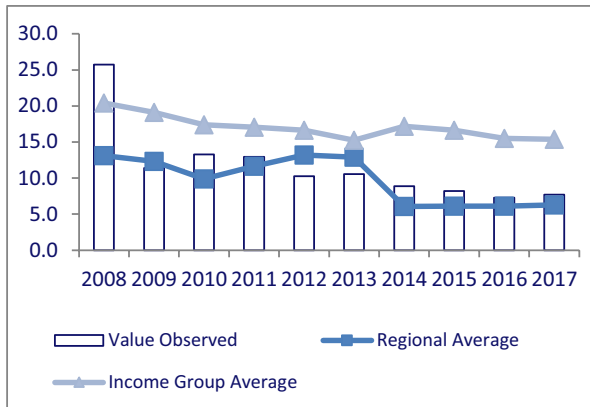


Fig. 5 Non-interest income/Total income: Bangladesh and peer group, %. Source: Finstat database (2019). Value observed is for Bangladesh

interest revenues and expenses that banks incur, divided by total assets or interest earning assets. Unlike the ex-ante spread, the NIM can provide a broader examination of costs by considering loan defaults and all operating expenses.

The study initially conducts an accounting decomposition of ex-post intermediation costs using bank level micro data over period June 2017—June 2019. The decomposition analysis across bank categories based on their ownership status provides additional insights on the role of state on financial sector. The accounting decompositions are then represented in simple bar charts of relative contributing factors. The simple accounting identity in the bank balance sheet suggests:

$$\frac{BTP}{TA} = \frac{ATP}{TA} + \frac{TX}{TA} \tag{1}$$

where, *BTP* is before tax profit, *ATP* is after tax (*TX*) profit and *TA* is total assets. Income statement imply the following identity for before tax profit:

$$\frac{BTP}{TA} = \frac{NI}{TA} + \frac{NII}{TA} - \frac{OP}{TA} - \frac{LLP}{TA} \tag{2}$$

where, *NI* is net interest income and *NII* refers to non-interest income, *OP* refers to operating costs and *LLP* is loan loss provisioning. The accounting items are all scaled by *TA*. Equation (1) and (2) imply,

$$\frac{NI}{TA} = \frac{ATP}{TA} + \frac{TX}{TA} + \frac{OP}{TA} - \frac{NII}{TA} + \frac{LLP}{TA} \tag{3}$$

The accounting decomposition of the NIM based on financial statement items, therefore, is:

$$Net\ interest\ margin = \frac{Interest\ revenue - interest\ expenses}{Total\ assets} = \frac{Net\ interest\ income}{Total\ assets} \tag{4}$$

Equivalently from Eq. (3),

$$\begin{aligned} \text{Net interest margin} = & \frac{\text{After tax profit}}{\text{Total assets}} + \frac{\text{Provision for tax}}{\text{Total assets}} - \frac{\text{Non interest income}}{\text{Total assets}} \\ & + \frac{\text{Operating costs}}{\text{Total assets}} + \frac{\text{Loan loss provision}}{\text{Total assets}} \end{aligned} \quad (5)$$

After decomposing NIM into its constituent parts as in Eq. (5) and measuring the contribution of each part, the study investigates other factors of the business environment in which the banks operate and get influenced by in decision making. These other factors including macroeconomic variables, that affects NIM but not captured in the accounting decomposition, are incorporated in the econometric model. The regression analysis is, therefore, the second part of the analysis.

Estimation of the model of Ho and Saunders (1981) and its subsequent literature on the determinants of interest margin usually follow two approaches. One is the two-stage process. In the first stage, a pure margin is obtained by controlling for explanatory variables not introduced explicitly in the theoretical model. In the second stage, the relationship between the pure margin and variables derived from the theoretical model is estimated. The other approach is the single-stage estimation process (McShane and Sharpe 1985, Angbazo 1997 and Maudos et al. 2004) where theoretical variables explaining margin and additional variables not incorporated in the theoretical model but reflect other important aspects are included. The two-stage method requires long time series.

This study uses biannual data for a relatively shorter time: June 2015–December 2020 for all banks in Bangladesh. Given the shorter time span, following the literature, we apply a fixed effect panel data model to estimate the following basic model over a slightly extended period than the accounting decomposition analysis:

$$nim_{i,t} = \beta_0 + \beta_1 B_{i,t} + \beta_2 M_{i,t} + \varepsilon_{i,t} \quad (6)$$

In Eq. (6), $nim_{i,t}$ is the net interest margin of bank i in time t measured as the net interest income scaled by total interest earning assets. $B_{i,t}$ is the vector of bank level variables and $M_{i,t}$ is the vector of macroeconomic variable(s) and $\varepsilon_{i,t}$ is the error term. The dependent variable net interest margin ($nim_{i,t}$) is calculated as the ratio of total interest earning minus total interest cost divided by total interest earning assets. This is the baseline measure of cost of financial intermediation. As a robustness check we also use total assets in the denominator instead of only interest earning assets. Rationale for the explanatory variables $B_{i,t}$ along with their proxies are summarized in Table 1.

Operational size Ideally the operational size will be total volume of loans divided by number of loans. Since we do not have data for number of loans, following other empirical practices log of gross loans is used as a proxy for operational size. Theoretical models in the literature predict a positive relation between size of lending operation and interest margin as bigger loans involve bigger potential losses. In contrary, economies of scale can be achieved by larger size of operations that can

Table 1 Empirical model variables and proxies

| Variable | Proxy | Predicted coefficient sign | Rationale |
|------------------------|-----------------------------------------------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Size of operation | Log (gross loans) | ± | If volume of loans increases then potential losses increase, so, expected margin increase. In contrary, larger size of loans may offer economies of scale in operation implying a fall in margin. Hence, both positive and negative signs can be expected |
| Risk aversion | Total investment in securities/ Total interest earning assets | + | Investment is risky So, an increase in risk aversion of banks will increase margin |
| Capital adequacy ratio | Capital to risk weighted assets ratio | + | Better capitalized banks require higher margin |
| Overhead costs | Operating expenses/ Total interest earning assets | + | Banks incurring higher operating costs charge higher margins to cover the costs |
| Credit risk | Provisions for bad loans/ Total loans | + | If bad loans increase, required provisions increase, which is costly. So, if credit risk increases, the margin increases |
| Income diversification | Non-interest income/Total revenue | - | If products and services diversification increase, then fee-based income increase, and margins decrease |
| Ownership type | Ownership dummy = 1 if state-owned; = 0 if private sector owned | - | Regulatory forbearance enjoyed by state-owned banks' affect the management quality negatively. SOBs also have developmental roles. A positive relation is assumed between management quality and interest margin |
| Inflation | CPI inflation rate | + | If inflation increase, macroeconomic instability increases and margin increase |

reduce required margin implying negative sign. So, both positive and negative sign of the estimated coefficient is possible, which depends on the dominating effect.

Risk aversion Banks' investment over total asset is considered as a measure of risk aversion. A positive sign is expected, as a bank will require higher margin to compensate itself for taking more risks through investment.

Capital adequacy ratio Capital to risk weighted assets ratio is used as a measure of capital adequacy and its relationship with net interest margin is expected to be positive. For a particular level of capital if risk weights of loans increase then the capital adequacy ratio will decrease. Therefore, to increase the ratio banks will charge higher interest margin to have higher income. Any retained earnings can be added to capital. There is a minimum required capital adequacy ratio (10 percent) by the regulators, any excess of which is considered as a buffer capital. In state-owned banks in Bangladesh the ratio is below the minimum regulatory requirement.

Overhead costs Average overhead cost is proxied by operating costs over total interest earning assets. This captures bank to bank differences in operational efficiency. Relationship of this variable with interest margin is expected to be positive. If a bank requires more staffs and logistics to run its business for example, then the additional costs will be passed over to its customers in the form of higher interest margin. In Bangladesh, the operating costs are particularly bigger in banks that have large branch networks in rural areas and are less automated.

Credit risks Loans that have high risks of default require more monitoring and if they become bad there are additional costs of provisioning. Banks take this into account by adding a risk premium implicitly in the loan pricing. Here, credit risk is measured by provision maintained against bad loans to total loans and a positive relation is predicted. In Bangladesh provision maintenance is inadequate in most of the banks and the overall bank sector suffers from high non-performing loans.¹

Income diversification Income diversification refers to bank's ability to diversify its income sources away from loan business to non-interest income such as fees, commissions to operate at interest low margin. By diversifying income sources banks can compensate any income losses due to decrease in interest margins and maintain desired profitability. Therefore, a negative relationship is predicted. This is measured as non-interest income to total operating income, where, operating income refers to net interest income plus non-interest income.

¹ The gross non-performing loans of overall banking sector as of December 2019 was 11 percent which is thought to be much higher if regulatory forbearance in the form of frequent rescheduling, restructuring and relaxed classification rule compared to international best practice are taken into account.

Table 2 Accounting decomposition of NIM over 2017–2019

| | Components as a percentage of Total interest earning assets (<i>TA</i>) | | | | | Components as percent of Net Interest Income (<i>NI</i>) | | | |
|---------------------------------|---------------------------------------------------------------------------|----------------------|-------|-----------|------------------|------------------------------------------------------------|------|-----------|------------------|
| | NI/TA | Oper exp—Non int inc | Tax | Provision | After Tax profit | Oper exp—Non int inc | Tax | Provision | After Tax profit |
| All banks | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Jun 2017 | 3.2 | 1.19 | 0.63 | 1.01 | 0.35 | 37.4 | 19.7 | 31.8 | 11.2 |
| Dec 2017 | 3.2 | 0.92 | 0.72 | 0.66 | 0.88 | 29.0 | 22.6 | 20.7 | 27.6 |
| Jun 2018 | 3.1 | 1.32 | 0.65 | 0.88 | 0.30 | 41.8 | 20.8 | 28.0 | 9.4 |
| Dec 2018 | 3.2 | 1.12 | 0.63 | 1.16 | 0.32 | 34.6 | 19.6 | 35.9 | 9.9 |
| Jun 2019 | 3.0 | 1.27 | 0.58 | 0.87 | 0.27 | 42.4 | 19.5 | 29.1 | 9.1 |
| State-owned banks (SOBs) | | | | | | | | | |
| Jun 2017 | 1.8 | 1.5 | 0.04 | 1.25 | -1.0 | 83.9 | 2.4 | 67.4 | -53.7 |
| Dec 2017 | 1.9 | 0.7 | 0.38 | 0.59 | 0.2 | 38.9 | 20.2 | 30.7 | 10.2 |
| Jun 2018 | 2.1 | 1.6 | 0.34 | 1.25 | -1.1 | 78.7 | 16.4 | 59.8 | -54.9 |
| Dec 2018 | 2.2 | 1.1 | 0.17 | 2.52 | -1.6 | 48.5 | 8.0 | 115.3 | -71.7 |
| Jun 2019 | 1.6 | 1.7 | -0.04 | 1.44 | -1.5 | 105.4 | -2.4 | 89.1 | -92.1 |
| Private commercial banks (PCBs) | | | | | | | | | |
| Jun 2017 | 3.57 | 1.1 | 0.79 | 0.89 | 0.79 | 31.0 | 22.0 | 24.9 | 22.0 |
| Dec 2017 | 3.52 | 1.0 | 0.78 | 0.68 | 1.02 | 29.7 | 22.1 | 19.3 | 28.9 |
| Jun 2018 | 3.43 | 1.3 | 0.69 | 0.79 | 0.65 | 37.9 | 20.1 | 23.1 | 18.9 |
| Dec 2018 | 3.55 | 1.2 | 0.74 | 0.69 | 0.89 | 34.6 | 20.9 | 19.5 | 25.0 |
| Jun 2019 | 3.42 | 1.2 | 0.73 | 0.71 | 0.73 | 36.2 | 21.5 | 20.9 | 21.5 |
| Foreign commercial banks (FCBs) | | | | | | | | | |
| Jun 2017 | 4.38 | -0.47 | 1.66 | 0.71 | 2.47 | -10.7 | 38.0 | 16.3 | 56.4 |
| Dec 2017 | 4.35 | -0.23 | 1.56 | 0.44 | 2.59 | -5.3 | 35.7 | 10.0 | 59.6 |
| Jun 2018 | 4.64 | -0.32 | 1.79 | 0.07 | 3.10 | -6.9 | 38.6 | 1.5 | 66.8 |
| Dec 2018 | 4.30 | -0.19 | 1.57 | 0.20 | 2.71 | -4.3 | 36.6 | 4.6 | 63.1 |
| Jun 2019 | 4.39 | -0.46 | 1.72 | 0.19 | 2.94 | -10.4 | 39.2 | 4.4 | 66.8 |

Ownership type State-owned banks have developmental roles and enjoy significant regulatory forbearances. These affect the quality of management and business activities such as seeking high profit assets and low-cost liabilities, negatively. A positive relation is assumed between management quality and interest margin, which in turn, implies that a bank having state-ownership will require smaller interest margin.

Inflation Fluctuations in price level bring uncertainty for both borrowers and lenders that needs to be compensated by charging higher spread. Therefore, CPI inflation is included in the model to capture macroeconomic instability.

4 Accounting decomposition of net interest margin

The net interest margin (NIM) is decomposed into its constituent parts as percent of total interest earning assets: operating expenses minus non-interest income, tax, provisions for bad loans and profits net of tax and provisions. The NIM weighted by total interest earning assets (TA) and its constituent parts as in Eq. (3) are presented in Columns 1–5 of Table 2. Columns 6–9 presents the components as percent of net interest income (NI). We present the analysis for overall bank sector and for category wise—State-owned Commercial Banks (SOBs), Private Commercial Banks (PCBs) and Foreign Commercial Banks (FCBs).

For overall bank sector, the average NIM from Column 1 is 3.14 percent during the study period and operating cost is the largest component in it. Such expenses include inter alia costs for branches, equipment and personnel to serve and monitor clients. Low levels of automation and inefficient organization structures can exacerbate operating expenses. In Appendix Figs. 6 and 7 are graphical representation of NIM decomposition for overall banking sector. In Columns 2 and 6 of Table 2, the net operating cost is calculated by subtracting non-interest income (*Non int inc*) from operating expenses (*Oper exp*). This cost is around 37.4 percent of the net interest income of the industry in Column 6. The second big component is the provision costs for bad loans in Columns 4 and 8. Provisions to total interest earning assets is above 0.9 percent in Column 4 and accounts for 29 percent of the total NIM in Column 8. Given the high NPLs and inadequate maintenance of provision, this component could be larger if asset quality was properly reviewed and adequate provisions were maintained.

The third big constituent part of NIM is the ratio of tax expenses. The tax refers to explicit corporate income tax only. It absorbed on average 0.64 of NIM for overall sector in Column 3. Higher provisioning makes the taxable income base narrower as the provision for NPLs is a tax-deductible expense.

The bottom-line profitability of the overall bank sector appears moderate and is the smallest component of NIM. In Column 5, average profit margin during the study period was 0.42 percent which is only 13.4 percent of net interest income (NI) in Column 9.

The variations of NIM among bank groups are substantial as depicted in Fig. 3 in Section 2 and in subsequent rows of Table 2. SOBs (including the two specialized development banks) have the lowest margin on average at 1.92 percent, followed by PCBs and FCBs at 3.5 and 4.41 percent respectively. Graphical representations of decomposition for SOBs are in Figs. 8 and 9, for PCBs are in Figs. 10 and 11 and for FCBs are in Figs. 12 and 13 in the Appendix. The higher NIM of FCBs pulled the industry's average NIM up to 3.14 percent. Operating expenses is the largest component of the NIM for domestic banks. Foreign banks have negative net operating expenses, meaning that FCBs earn higher fee-based income that outweighs the overhead costs. In contrast, the net operating costs as percent of net interest income of SOBs in Column 6 is very high (71 percent on average), which can be attributed to low automation and large rural branch network². SOBs

have lower non-interest income than PCBs, possibly explained by pursuing the developmental role, unaccounted fees for government services and their accounting practices.

In SOBs the share of provisioning costs in the NIM is significantly higher (almost double) compared to PCBs, since the NPL ratio is worst among the SOBs. In contrary, provision cost is lower in FCBs, with a declining trend. Unlike SOBs, the tax share absorbs a significant part of NIM in PCBs and FCBs. As shown in Columns in 3 and 7, tax component is about double in case of FCBs compared to PCBs. After tax profit in Columns 5 and 9 is a substantial part of net interest margin only for FCBs and negative for SOBs. FCBs have branch networks in urban areas only and pursue businesses more selectively, which may be the driver behind higher after-tax profit compared to other groups. Higher non-interest income and lower loan-loss provisioning compared to the other bank groups generate higher after-tax profit for the FCBs. In Column 9, while FCBs' average after tax profit margin is 63 percent of net interest income, it is only 23 percent for PCBs and -52 percent for SOBs.

Overall, the accounting decomposition suggests that the higher operating costs arising from inefficient business operation is the main component of net interest margin, followed by the provisioning costs due to high stock of NPLs. Except foreign banks, net profit enjoyed by the rest of the sector is moderate. The scope to maintain lower provisions than the required level allows banks to charge margins at slightly lower level. Banks are doing business with lower after-tax profit margin, which has a downward trend, compared to any South Asian country. The fierce competition among domestic banks in an over-banked industry contributes to declining after tax profit margin. Fee based non-interest income is used mainly by FCBs to circumvent the regulatory pressure of keeping lending rate low and absence of transparency and disclosure requirements in fees schedule promote banks to charge higher fees.

5 Estimation results of intermediation costs

The accounting exercise in Sect. 3 ascertains the drivers of the costs of intermediation by identifying the items in bank's income statement that make up the net interest margin. This first step is complemented by the econometric estimation in this section by taking into account banks' responses to various regulatory and macroeconomic variables when determining their intermediation costs. The two steps together give a holistic view about the drivers of financial intermediation costs. We have a strongly balanced panel data. The number of time span is shorter ($T=12$) and the number of banks is much larger ($N=58$) in each time period. The correlation matrix and descriptive statistics are presented in Appendix Table 4 and Table 5.

Following the discussion in Section 3, a panel data estimation of Eq. (6) is presented in Table 3. The Hausman test confirms the validity of the fixed effect model.

Table 3 Determinants of NIM: panel data estimation

| Dependent variable: <i>nim</i> | | | Panel fixed effect coefficients | | |
|--------------------------------|----------------------|----------------------|---------------------------------|----------------------|-----------------------|
| (1) | (2) | (3) | (4) | (5) | (6) |
| <i>Log(gloans)</i> | 0.36 (1.24) | -0.524** (-2.44) | 1.29* (-1.93) | -0.46 (-0.77) | |
| <i>riskav</i> | 0.023* (1.79) | 0.011 (0.86) | -0.032 (-1.48) | -0.035** (-2.55) | 0.02 (1.50) |
| <i>ovhd</i> | 0.64*** (5.14) | 0.73*** (5.33) | 0.28 (1.33) | 0.38 (1.41) | 0.57*** (4.42) |
| <i>crar</i> | 0.006* (1.86) | 0.003 (1.09) | -0.024 (-1.18) | -0.019 (-0.61) | 0.005* (1.86) |
| <i>crisk</i> | -0.029 (-0.76) | -0.037 (-0.96) | -0.064** (-2.29) | -0.062*** (-3.15) | |
| <i>includiv</i> | -0.0001** (-2.19) | -0.0002** (-2.33) | 0.0001 (-1.56) | 0.0001 (-1.66) | -0.0002*** (-2.99) |
| <i>inf</i> | – | 0.014 (0.073) | – | 0.003 (0.013) | |
| <i>Log(gloans) × m</i> | | | -0.74 (-1.28) | -0.065 (-0.104) | |
| <i>riskav × m</i> | | | 0.066*** (2.67) | 0.052*** (-2.68) | |
| <i>ovhd × m</i> | | | 0.43* (1.68) | 0.43 (-1.33) | |
| <i>crar × m</i> | | | 0.031 (1.48) | 0.022 (0.72) | |
| <i>crisk × m</i> | | | 0.02 (0.28) | 0.01 (0.15) | |
| <i>includiv × m</i> | | | -0.001 (-0.37) | -0.001 (-0.24) | |
| <i>cons</i> | -0.068 (-0.051) | 3.46* (-1.80) | -1.30 (-0.95) | 3.55* (1.85) | 1.64*** (3.48) |
| R-square-within | 0.32 | 0.25 | 0.37 | 0.27 | 0.31 |
| N | 336 | 336 | 336 | 336 | 336 |

** $p < 0.1$, *** $p < 0.05$, **** $p < 0.01$. t-values are in parenthesis. Models in column 2, 4, and 6 controlled for time trend.

In the baseline, we consider NIM defined as a ratio of net interest income to total interest earning assets. We check consistency of the results, presented in Appendix Table 7, by constructing NIM as a ratio of net interest income to total assets (nim_{alt}). We also perform a range of diagnostic tests such as group-wise heteroskedasticity and cross sectional dependence tests (Appendix Table 6). Based on the diagnostic tests, we calculate the Driscoll-Kraay standard errors (Appendix Table 8) which are

robust for cross sectional dependence in addition to robust standard errors in Table 3 for comparison.

In Table 3 we present bank level fixed effect estimates of four different versions of the model with robust standard errors in Columns 2–5. Column 6 includes the significant variables from (2). In Column 2 only financial sector variables are used as explanatory variables and Column 3 includes a macroeconomic variable. These two versions are augmented with interaction terms between bank specific variables and bank ownership dummy in Columns 4–5.

It is important to recognize the rationale behind State-owned banks (SOBs) and whether the state ownership matters in banks' risk appetite and determination of net interest margins. This is because (i) SOBs have some developmental mandates mixed with commercial objectives (ii) SOBs provide government services such as social safety-net payments, issuance of letter of credit for government procurement with a minimum fees (iii) SOBs perform poor in intermediation as they enjoy huge rural and public sector deposits at lower costs than PCBs but their credit to deposit ratio is lower than PCBs (iv) SOBs lack capability to identify high profitability projects and have higher non-performing loans requiring them greater provision maintenance (v) SOBs enjoy more regulatory forbearance and implicit government guarantee. There were several instances of recapitalization from government budget but SOB's continuing to remain under-capitalized. Given these features of SOBs, we interact the bank level variables with bank ownership dummy to see if the effects of determinants of NIM vary based on ownership of state or private sector. The coefficient of the interaction term tells us how much effect variable X2, for example, has on the effect of X1 on $nim_{i,t}$. If the interaction coefficient is positive, then the effect of X1 on $nim_{i,t}$ increases as X2 increases, if negative the opposite. If the interaction coefficient is zero, then the effect of X1 on Y is independent of X2.

The size of lending operation, *Log(gloans)*, has negative sign in Column 3 model, which alters sign in the model (4) where we control size of operation separately for SOBs. The coefficient is negative implying dominance of scale of economies effect when we include macro variable but positive when no macro impact is controlled. Similarly, coefficient of risk aversion (*riskav*) appears positive in model (2) validating the fact that banks require higher margins to be able to take more risky investments, but it is negative in model (5) when controlling for impacts of state ownership on the way risk aversion affects *nim*. Interestingly, the coefficient of risk aversion interaction term appears significantly positive in both Columns 4–5, as predicted theoretically.

Next, we turn to the overhead cost (*ovhd*) which appears to have significant coefficient with theoretically predicted positive sign across all models except in (5) which, however, is not significant. However, the magnitude is slightly smaller in the models with interaction terms in Columns 4–5. The positive sign of the (*ovhd* × *m*) in (4) indicates that the positive role of overhead costs on *nim* is reinforced by the characteristic of state-ownership. Banks tend to pass on the additional staff costs and other operational costs to their customers in the form of higher interest margin. This

is particularly true for the PCBs which have purely commercial business objective. In terms of magnitude, operating costs have the biggest significant impacts in NIM determination in this study, which is fully realistic in the context of Bangladesh. Banks' capital to risk weighted assets ratio (*crar*) has small positive but significant impact on NIM in model (2). Banks that require higher risk weighted capital are likely to charge higher interest margin. The CRAR of the SOBs are below the minimum level required by regulation but they still charge lower NIM compared to private banks.

Credit risk (*crisk*), has significant negative effect on NIM in models (4) and (5), however, the coefficients of interaction terms appear positive but insignificant. This result appears counter-intuitive. Banks in Bangladesh, including private banks, are under provisioned and often enjoy regulatory relaxations in maintaining minimum required provisions. The level of provision, although is a substantial cost, is not commensurate to the level of non-performing loans and indicates lack of resilience of the financial sector to shocks. Given that credit risk is measured by provision to gross loans, this explains the apparently counter-intuitive result. Banks' ability to diversify income sources (*includiv*), for example through fee based services, appears to have small but significant negative impacts on NIM in Columns 2, 3, and 6—as theoretical predicted. In Bangladesh the business modality is that usually the foreign banks who charge higher NIM also have higher fee income. SOBs, in contrary, charge lower interest margins and earn lower fee income.

In Appendix Table 8, we achieve greater number of significant coefficients with Driscoll-Kraay standard errors that are robust for cross sectional dependence. Here, macroeconomic volatility, measured by inflation (*inf*), has positive but insignificant effect on NIM. Overall, the results are empirically sensible and suggest that the financial variables are more important than the macroeconomic variables in determining the net interest margin in Bangladesh.

6 Conclusion

Intermediation cost is an important consideration for economic development, particularly in countries where financial sector is bank centric and banks are the largest sources of corporate finance. Given the government's move to fixing lending rate ceiling to a single digit, this study analyses bank intermediation costs of Bangladesh to understand the appropriateness of such policy and how net interest margin can be reduced to lower the intermediation costs. This is done by first, an accounting decomposition of net interest margin into its costs and profit components, and second, econometric estimation to find important determinants of the net interest margins in Bangladesh. Since state-owned banks play a major role in the banking sector, bank category-wise analysis has been done to reflect on state-ownership impacts in the industry. The decomposition analysis suggests

that net operating expenses, which is a measure of inefficiency in business operation, is the biggest component of NIM and the share of after-tax profit is only at a moderate level. The second part of the analysis suggest that financial variables such as operating expenses, size of operations and risk aversion influence banks' determination of NIM significantly rather than macroeconomic variables, and the state-ownership affects the way each of risk aversion, capital adequacy and credit risk affect NIM significantly.

The study does not find excessive profit seeking behavior in the data used for the study, therefore, an interest rate cap policy is unlikely to reduce the borrowing cost without unintended negative consequences. Focusing on policies related to operating efficiency and asset quality could be more productive. Moderate after-tax profit margins could not sustain the effects of an interest rate cap without impacting the banks' capital position and financial stability (with further negative spillovers to trade and commerce). In order to reduce intermediation costs, policy should focus on enhancing operating efficiency through increased automation, particularly in the SOBs. Also, SOBs objectives should be aligned to the rationale for state-ownership rather than to profit seeking objectives of the PCBs. In addition, policy must focus on resolving the stock and flow of NPLs so that loan loss provisioning absorbs less of the NIM. Notably, this will also have a positive impact on the corporate tax revenue. Some other strong candidates for control variables such as opportunity costs of holding reserves, creditors' rights over collateral in the event of bankruptcy and GDP per capita cannot be added in the analysis due to data unavailability.

Appendix

Table 4 Correlation matrix

| | <i>nim</i> | <i>Log(loans)</i> | <i>riskav</i> | <i>ovhd</i> | <i>crar</i> | <i>crisk</i> | <i>incdiv</i> | <i>m</i> | <i>inf</i> |
|-------------------|------------|-------------------|---------------|-------------|-------------|--------------|---------------|----------|------------|
| <i>nim</i> | 1 | | | | | | | | |
| <i>Log(loans)</i> | 0.007 | 1.0 | | | | | | | |
| <i>riskav</i> | 0.059 | -0.210 | 1.0 | | | | | | |
| <i>ovhd</i> | 0.208 | -0.251 | -0.275 | 1.0 | | | | | |
| <i>crar</i> | 0.368 | -0.296 | 0.367 | -0.261 | 1.0 | | | | |
| <i>crisk</i> | 0.005 | 0.168 | 0.213 | -0.100 | 0.044 | 1.0 | | | |
| <i>incdiv</i> | -0.119 | 0.028 | -0.005 | -0.058 | 0.019 | 0.094 | 1.0 | | |
| <i>m</i> | 0.435 | -0.172 | -0.190 | -0.076 | 0.210 | -0.21 | -0.145 | 1.0 | |
| <i>inf</i> | 0.071 | -0.108 | 0.113 | 0.034 | 0.008 | 0.008 | -0.018 | -0.0 | 1 |

Table 5 Summary statistics of the panel data

| Variable | | Mean | Std. Dev | Min | Max | Observations |
|--------------------|---------|-------|----------|----------|---------|--------------|
| <i>nim</i> | overall | 3.29 | 1.62 | -3.00 | 8.01 | N=672 |
| | between | | 1.44 | -0.85 | 5.83 | n=56 |
| | within | | 0.75 | -0.89 | 6.37 | T=12 |
| <i>nim_alt</i> | overall | 2.87 | 1.41 | -2.72 | 7.08 | N=672 |
| | between | | 1.26 | -0.73 | 5.13 | n=56 |
| | within | | 0.65 | -0.96 | 5.62 | T=12 |
| <i>Log(gloans)</i> | overall | 4.43 | 1.27 | 0.92 | 6.95 | N=672 |
| | between | | 1.25 | 1.45 | 6.55 | n=56 |
| | within | | 0.29 | 3.23 | 6.07 | T=12 |
| <i>riskav</i> | overall | 17.54 | 11.13 | 0.02 | 60.20 | N=672 |
| | between | | 10.23 | 0.03 | 48.44 | n=56 |
| | within | | 4.58 | -12.86 | 46.21 | T=12 |
| <i>ovhd</i> | overall | 2.57 | 0.91 | 0.47 | 6.82 | N=672 |
| | between | | 0.85 | 0.62 | 5.14 | n=56 |
| | within | | 0.33 | 1.25 | 4.25 | T=12 |
| <i>crar</i> | overall | 14.40 | 26.44 | -133.25 | 148.87 | N=336 |
| | between | | 24.26 | -94.76 | 107.12 | n=56 |
| | within | | 10.92 | -106.53 | 121.72 | T=6 |
| <i>crisk</i> | overall | 0.94 | 1.58 | -4.30 | 15.12 | N=672 |
| | between | | 0.88 | -0.55 | 4.57 | n=56 |
| | within | | 1.32 | -3.60 | 13.60 | T=12 |
| <i>incdiv</i> | overall | 32.58 | 232.50 | -1454.60 | 5685.33 | N=672 |
| | between | | 61.47 | -84.80 | 450.78 | n=56 |
| | within | | 224.36 | -1337.22 | 5267.13 | T=12 |
| <i>m</i> | overall | 0.86 | 0.35 | 0.00 | 1.00 | N=672 |
| | between | | 0.35 | 0.00 | 1.00 | n=56 |
| | within | | 0.00 | 0.86 | 0.86 | T=12 |
| <i>inf</i> | overall | 5.70 | 0.29 | 5.44 | 6.41 | N=672 |
| | between | | 0.00 | 5.70 | 5.70 | n=56 |
| | within | | 0.29 | 5.44 | 6.41 | T=12 |

Table 6 Diagnostic tests

(i) Test for heteroskedasticity using *xttest3* (modified Wald test for groupwise heteroskedasticity in fixed effect regression model) in Stata

Null hypothesis: $\sigma(i)^2 = \sigma^2$ for all (homoskedasticity)

chi2 (56) = 3581.15

Prob > chi2 = 0.00

Therefore, reject null and there is presence of heteroskedasticity. This implies use robust option in Stata fixed effect model to obtain heteroskedasticity robust standard errors

(ii) Tests for cross-sectional dependence

Test: *xtcsd*, *frees*

Test: *xtcsd*, *pesaran*

Null hypothesis: cross sectional independence

Null hypothesis: cross sectional independence

Test statistics = 0.93

Test statistics = 4.642

Critical values from Frees' Q distribution:

Pr = 0.00

alpha = 0.10: 0.4127

alpha = 0.05: 0.5676

alpha = 0.01: 0.9027

Reject null and there is evidence of cross sectional dependence

Reject null and there is evidence of cross sectional dependence

This suggests using Driscoll and Kraay (1998) standard errors that produce standard errors robust for any cross sectional dependence

Table 7 Robustness: NIM is a ratio of net interest income over total assets

| Dependent variable: nim_{it} | | | Panel fixed effect coefficients | | |
|--------------------------------|----------------------|----------------------|---------------------------------|-----------------------|----------------------|
| (1) | (2) | (3) | (4) | (5) | (6) |
| <i>Log(gloans)</i> | 0.37 (1.23) | -0.51** (-2.55) | 1.263** (2.032) | -0.454 (-0.784) | |
| <i>riskav</i> | 0.022* (1.96) | 0.009 (0.79) | -0.027 (-1.40) | -0.032** (-2.501) | 0.019 (1.52) |
| <i>ovhd</i> | 0.286** (2.42) | 0.384** (2.66) | 0.248*** (3.02) | 0.355*** (3.065) | 0.213 (1.67) |
| <i>crar</i> | 0.006** (2.04) | 0.003 (1.04) | -0.023 (-1.23) | -0.018 (-0.627) | 0.005* (1.98) |
| <i>crisk</i> | -0.039 (-0.93) | -0.046 (-1.07) | -0.061** (-2.27) | -0.060*** (-2.770) | |
| <i>indiv</i> | -0.0001** (-2.13) | -0.0001** (-2.17) | 0.0001 (-1.44) | 0.0001 (-1.514) | -0.000*** (-3.14) |
| <i>inf</i> | – | -0.042 (-0.24) | – | -0.024 (-0.135) | |
| <i>Log(gloans) × m</i> | | | -0.753 (-1.4) | -0.074 (-0.125) | |
| <i>riskav × m</i> | | | 0.058** (2.66) | 0.046** (2.60) | |
| <i>ovhd × m</i> | | | 0.036 (0.22) | 0.034 (0.16) | |
| <i>crar × m</i> | | | 0.03 (1.57) | 0.022 (0.75) | |
| <i>crisk × m</i> | | | 0.006 (0.085) | 0.0004 (-0.005) | |
| <i>indiv × m</i> | | | -0.001 (-0.62) | -0.001 (-0.427) | |
| <i>cons</i> | 0.378 (0.28) | 4.252** (2.29) | -0.629 (-0.46) | 4.256** (2.32) | 2.129*** (5.33) |
| R-squared- within | 0.26 | 0.17 | 0.30 | 0.18 | 0.25 |
| N | 336 | 336 | 336 | 336 | 336 |

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. t-values are in parenthesis. Models in column 2, 4, and 6 controlled for time trend

Table 8 Robustness: with Driscoll-Kraay standard errors assuming cross sectional dependence

| Dependent variable: <i>nim</i> | Panel fixed effect coefficients | | | | | |
|--------------------------------|---------------------------------|----------------------|-----------------------|----------------------|----------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| <i>Log(gloans)</i> | 0.36*** (8.26) | -0.52** (-3.945) | 1.29*** (9.90) | -0.46*** (-4.913) | 0.39*** (9.24) | |
| <i>riskav</i> | 0.023*** (4.49) | 0.011 (0.95) | -0.032** (-2.87) | -0.035* (-2.167) | 0.023*** (4.46) | |
| <i>ovhd</i> | 0.637*** (11.15) | 0.732*** (9.38) | 0.275 (0.63) | 0.382 (0.89) | 0.625*** (10.63) | |
| <i>crar</i> | 0.006*** (7.59) | 0.003* (2.11) | -0.024 (-1.24) | -0.019 (-0.88) | 0.006*** (6.70) | |
| <i>crisk</i> | -0.029 (-1.20) | -0.037 (-1.62) | -0.064*** (-5.51) | -0.062*** (-5.80) | | |
| <i>includiv</i> | -0.0001** (-2.83) | -0.0001** (-3.05) | 0.0001 (-1.703) | 0.0001 (-1.87) | | -0.0002** (-3.53) |
| <i>inf</i> | | 0.014 (0.11) | | 0.003 (0.019) | | |
| <i>Log(gloans) × m</i> | | | -0.741*** (-5.022) | -0.065 (-0.54) | | |
| <i>riskav × m</i> | | | 0.066** (3.91) | 0.052* (2.17) | | |
| <i>ovhd × m</i> | | | 0.428 (0.82) | 0.427 (0.86) | | |
| <i>crar × m</i> | | | 0.031 (1.65) | 0.022 (1.11) | | |
| <i>crisk × m</i> | | | 0.02 (0.45) | 0.01 (0.29) | | |
| <i>includiv × m</i> | | | -0.001 (-0.45) | -0.001 (-0.31) | | |
| <i>cons</i> | -1.051** (-3.34) | 3.463** (2.58) | 0 (.) | 3.55** (2.86) | -1.154** (-3.424) | |
| Within R-squared | 0.32 | 0.25 | 0.37 | 0.27 | 0.32 | |
| N | 336 | 336 | 336 | 336 | 336 | |

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. t-values based on Driscoll-Kraay standard errors are in parenthesis. Models in column 2, 4, and 6 controlled for time trend. Maximum lag 2

Fig. 6 All banks: breakdown of NIM

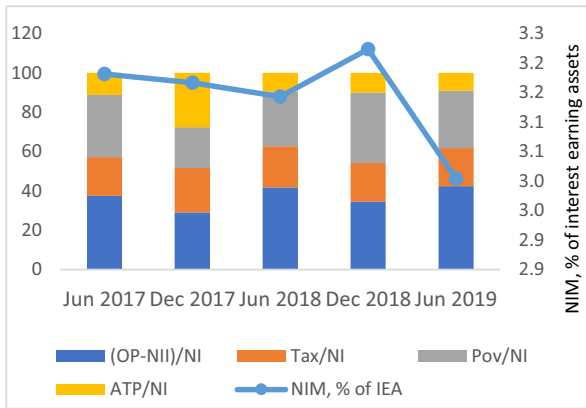
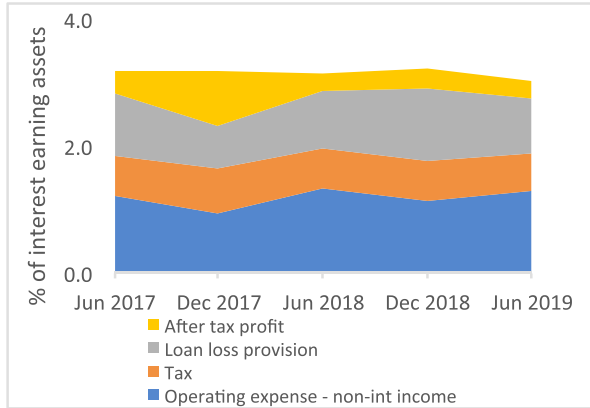


Fig. 7 All banks: NIM as % of NI

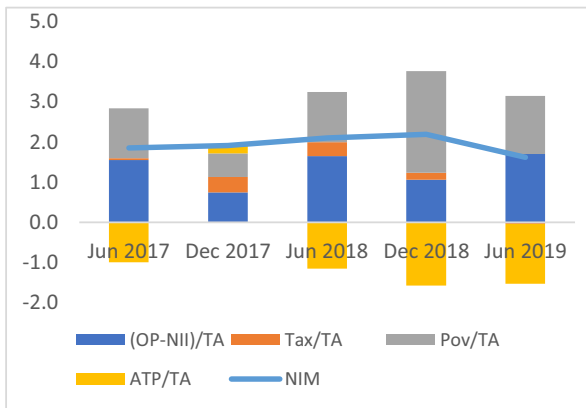


Fig. 8 SOBs: breakdown of NIM

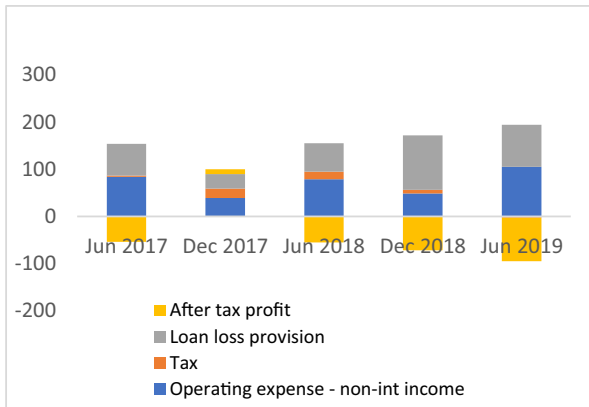


Fig. 9 SOBs: NIM as % of NI

Fig. 10 PCBs: breakdown of NIM

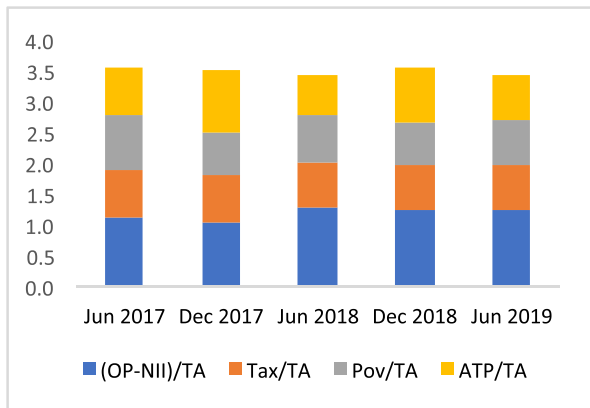


Fig. 11 PCBs: NIM as % of NI

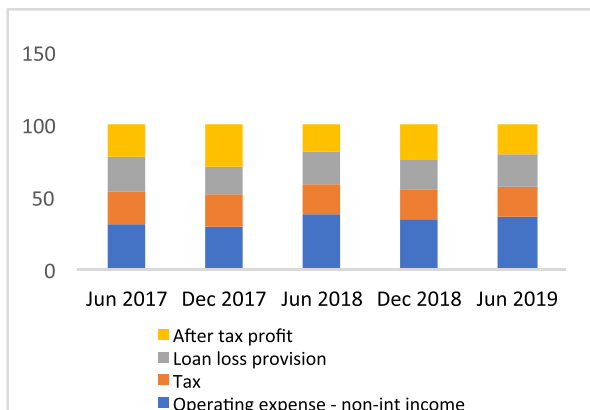


Fig. 12 FCBs: breakdown of NIM

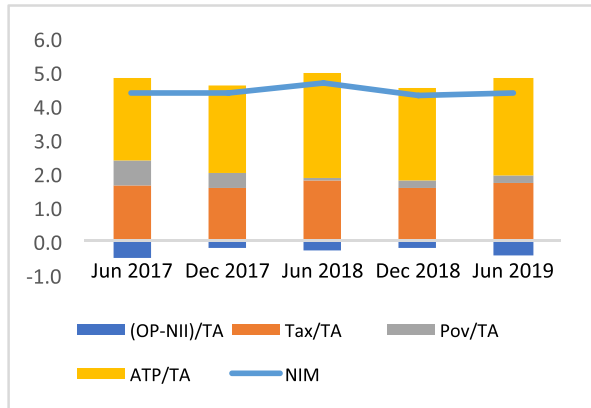
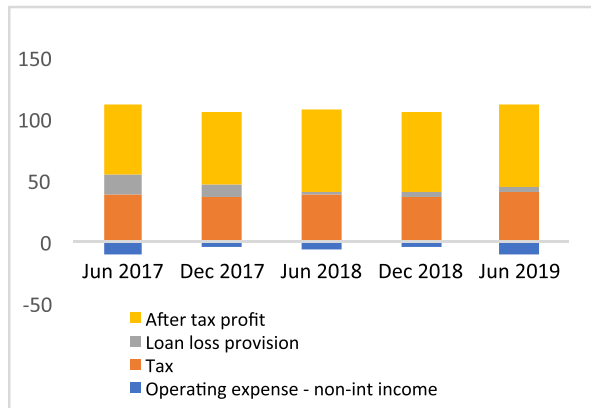


Fig. 13 FCBs: NIM as % of NI



Data availability Available.

Code availability Available.

Declarations

Conflicts of interest/Competing interests Not applicable

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