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Financial Sector and Economic Growth in India

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Financial Sector and Economic Growth in India

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ABSTRACT: India's financial sector has faced many challenges in recent decades, with a large, negative, and persistent credit to GDP gap since 2012. We examine how cyclical financial conditions affect GDP growth using a growth-at-risk (GaR) approach and analyze the link between bank balance sheets, credit growth, and long-term growth using bank-level panel regressions for both public and private banks. We find that on a cyclical basis, a negative shock to credit or a rise in macro vulnerability all shift the distribution of growth to the left, with lower expected growth and higher negative tail risks; over the long term, the results indicate that higher credit growth, arising from better capitalized banks with lower NPLs, is associated with higher GDP growth.

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WORKING PAPERS

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Contents

I. Introduction

India's financial sector has faced many challenges in recent decades, including a rapid increase in non-performing assets (referred hereafter as non-performing loans, NPLs) after the global financial crisis (GFC) and the 2018-2019 run on non-banking financial companies (NBFCs). Credit growth has been weak for some time, with a large, negative, and *persistent* credit to GDP gap since 2012. Just as the balance sheets of the financial sector started to gradually improve, the COVID-19 shock hit the economy, raising concerns about a new wave of NPLs and corporate defaults. At the same time, real GDP growth averaged 6.7 percent from 2011 to 2018, before moderating to 3.7 percent in 2019 (NBFC crisis) prior to the COVID-19 crisis. As India recovers from the pandemic, strong GDP growth will need to be sustained over the near- and medium-term for India to achieve many of its development goals.

This paper examines the nexus between the financial sector in India and economic growth and analyzes the potential impact of financial sector weakness on India's economic growth. The financial sector could affect economic growth through multiple channels, with both cyclical and long-term effects. This paper focuses on these two channels and abstracts from the question of whether the size or structure of the financial system is important for growth.1F[2] Specifically, this paper first examines how cyclical financial conditions affect GDP growth using a growth-at-risk (GaR) approach (Adrian et al., 2019) and assesses how financial conditions and credit risks could be associated with expected GDP growth going forward. Second, the paper analyzes the relationship between bank balance sheets, credit growth, and long-term growth using bank-level panel regressions for both public and private banks accounting for about 85 percent of total banking sector assets.

This paper is related to two strands of literature on financial sector and economic growth. The first strand examines the cyclical perspective. Adrian et al. (2019), Prasad et al. (2019) and IMF (2017) apply the GaR approach to use the information content of financial indicators to forecast risks to growth. Both fast-moving asset prices and slow-moving credit aggregates are found to be useful predictors of future output growth. For example, Ang, Piazzesi, and Wei (2006) highlight the importance of the yield curve, particularly short rate, in predicting GDP growth. Goodhart and Hofmann (2008) assess the linkages between credit, money, house prices, and economic activity in 17 industrialized countries over the last three decades and find that shocks to credit have significant repercussions on economic activity. Furthermore, recessions associated with financial crises are shown to have more severe and prolonged impact on the economy than typical recessions (see, for example, Claessens, Kose, and Terrones 2011a, 2011b). The second strand of the literature examines the link between the health of the banking sector and real GDP growth. For example, Levine (2005) found that countries with large, privately owned banks tend to channel credit to private enterprises and liquid stock exchanges and experience faster economic growth. Using balance sheet data for international banks from a

[2] For a discussion of this broader topic, see Demirguc-Kunt and Levine (2018) and references therein.

range of advanced economies, Gambacorta and Shin (2016) and Muduli and Behera (2021) show that well-capitalized banks enjoy lower costs of debt financing compared to more leveraged competitors, which in turn translates into higher annual credit growth and can impact monetary policy transmission.

The GaR analysis finds that higher credit and lower NPLs are associated with higher GDP growth in the near- and medium-term. More favorable credit conditions are particularly important during periods with low growth. A negative shock to credit and leverage could shift the entire growth distribution to the left, with lower expected growth and higher negative tail risks. The results for the second section of the paper confirm that in India, at least for private banks, the level of capitalization is strongly correlated with credit growth. The relationship for public banks appears to be much weaker. Additionally, it is when those banks which are better capitalized extend more credit that India observes higher real GDP growth, but only on the condition that these banks do not have excessive NPLs.

The paper is organized as follows. Section II examines the link between cyclical financial conditions and growth. Section III analyzes the link between financial sector and long-term growth. Section IV offers some concluding remarks.

II. Cyclical Financial Conditions and Near-Term Growth

A. Data and Stylized Facts

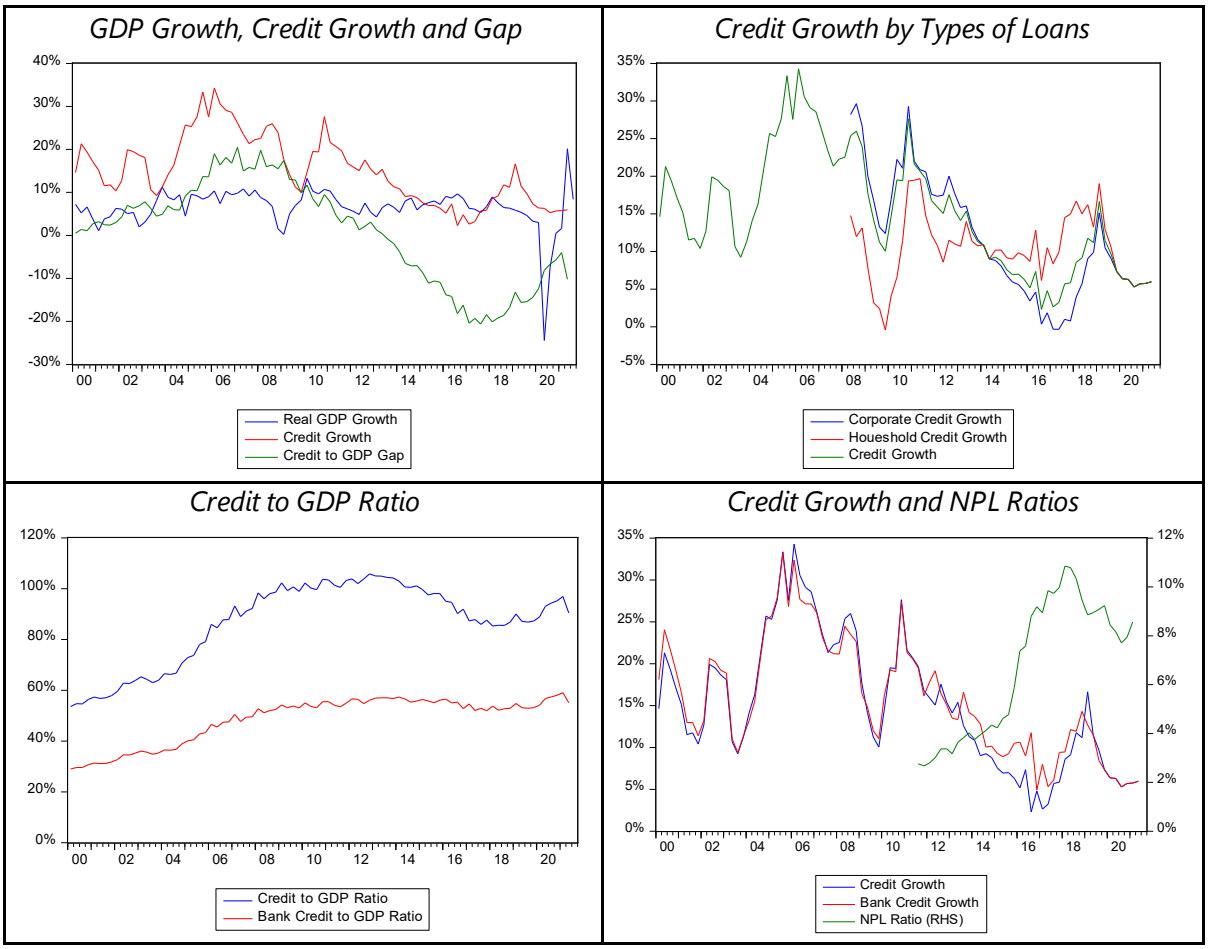
A quarterly database is constructed for macro-financial data for India from 2000Q1 to 2021Q3. The database covers key macro-financial variables, including GDP growth, inflation, policy rate, bond yields, sovereign spreads, stock prices, credit growth, credit to GDP gap, the NPL ratio, world growth, oil prices and exchange rates, and other macroeconomic variables. The database draws from multiple sources, including Haver Analytics, Reserve Bank of India, Central Statistics Office, International Monetary Fund, Bank of International Settlements, Ministry of Statistics and Programme Implementation, Bombay Stock Exchange, Energy Information administration/Chicago Mercantile Exchange, and Bloomberg. The detailed definition of the underlying data and sources can be found in Annex Table 1.

The analysis focuses on the broad definition of credit that covers both bank credit and debt securities. The credit-to-GDP ratio peaked at around 106 percent in 2012 and declined to around 90 percent in 2021, while the bank-credit-to-GDP ratios currently stands at around 55 percent. Following a period of double-digit credit growth, the credit-to-GDP gap2F[3] turned negative from 2012 (Figure 1). The decline in credit since 2012 was mostly driven by the deleveraging process

[3] The credit-to-GDP gap is based on BIS calculations, defined as the difference between the credit-to-GDP ratio and its long-term trend. According to the BIS, the long-term trend is computed using a one-side Hodrick-Prescott filter with lambda equal to 400,000, as credit cycles are on average longer than standard business cycles. For detailed methodology, please see Recent enhancements to the BIS statistics.

of the corporate sector. Corporate credit growth slowed from a peak of close to 30 percent in 2008 to zero at its trough, with a sharper decline in corporate credit growth compared with the household segment. At the same time, the broad credit growth also experienced a sharper slowdown than bank credit growth, suggesting that the deleveraging process not only took place in the banking sector, but also in broader debt financing. The NPL ratio peaked at around 11 percent in 2017 but has since come down to around 8 percent.

Figure 1: Credit and Leverage



Sources: Haver Analytics, Bank of International Settlements, Central Statistical Office, and International Monetary Fund.

B. Methodology

The GaR analysis in the India economy follows closely the approach of Adrian et al. (2019) and Prasad et al. (2019). GaR provides a tractable and robust estimation of the severity and the likelihood of a sharp economic slowdown. The model uses information contained in financial prices and aggregates to identify macro-financial linkages and gauge financial vulnerabilities. Importantly, GaR captures the entire growth distribution at different future horizons—reflecting

both downside and upside risks—in addition to central-scenario growth forecasts. The concept helps better understanding of the relative importance of key drivers of future growth.

The first step of GaR analysis involves aggregating the set of macrofinancial variables into economically meaningful groups ("partitions"). In this approach, five main partitions of macrofinancial variables are considered (Table 1): 1) domestic prices, which capture the policy interest rate, 10 -year treasury bond yield, sovereign bond spread, and a change in stock prices; 2) credit and leverage, which includes credit growth, the credit to GDP ratio, the credit to GDP gap, and the NPL ratio; 3) macroeconomic vulnerabilities, which capture inflation, the current account balance to GDP ratio, and the short-term external debt to reserve ratio; 4) external prices, which include changes in oil prices and exchange rates; and finally 5) external macro that captures world GDP growth. These partitions are then computed using the principal component analysis (PCA) that aggregates information about common trends among these macro-financial variables.

Table 1: Partition of Macro-Financial Variables

Domestic prices	Credit and leverage	Macro vulnerabilities	External prices	External Macro
• Policy rate • Treasury bill yields (10 year) • Sovereign spreads • Stock price change	• Credit growth • Credit to GDP ratio • Credit to GDP gap • NPL ratio	• Inflation • Current account balance to GDP ratio • Short-term external debt to reserve ratio	• Oil price change • Exchange rate change	• World GDP Growth

The second step of GaR uses a quantile regression approach to estimate the impact of financial conditions on different quantiles of real GDP growth in India. The following specification of the quantile regression is estimated:

$$y_{t+h}^{q} = \alpha^{q} + \beta_1^{q} X_{1,t} + \beta_2^{q} X_{2,t} + \beta_3^{q} X_{3,t} + \beta_4^{q} X_{4,t} + \beta_5^{q} X_{5,t} + \gamma^{q} y_t + \varepsilon_{t+h}^{q} \quad (1)$$

where y_{t+h}^{q} captures the *h* quarter ahead GDP growth (year-on-year) for quantile q; $X_{1,t}$ denotes the partition for domestic prices; $X_{2,t}$ captures the partition of credit and leverage; $X_{3,t}$ denotes the partition of macroeconomic vulnerabilities; $X_{4,t}$ represents the partition of external prices; and $X_{5,t}$ captures the partition of external macro conditions. Furthermore, ε_{t+h}^{q} denotes the residual, and $\alpha^{q}, \beta_1^{q}, \beta_2^{q}$ and β_3^{q} are the coefficients of the regression. In the analysis, five different quantiles (or percentiles) are considered, at 10 percent, 25 percent, 50 percent, 75 percent, and 90 percent, which capture the linkages between macro-financial conditions and growth at

different points of the future growth distribution. For example, the 10 percent quantile captures low growth periods (when growth rate is at the bottom 10 percentile), while the 90 percent quantile features high growth periods. Multiple forecast horizons (for example, 4 quarter ahead to 16 quarter ahead) are also considered to examine the impact of financial conditions on near- and medium -term growth.

Based on the results of the quantile regression, a t-skew distribution is then used to derive the probability density distribution of future GDP growth. The GaR framework could also be used to conduct scenario analysis, which examines the impact of shocks to the different partitions including credit and leverage, domestic prices, and macroeconomic vulnerabilities on the future growth distribution.

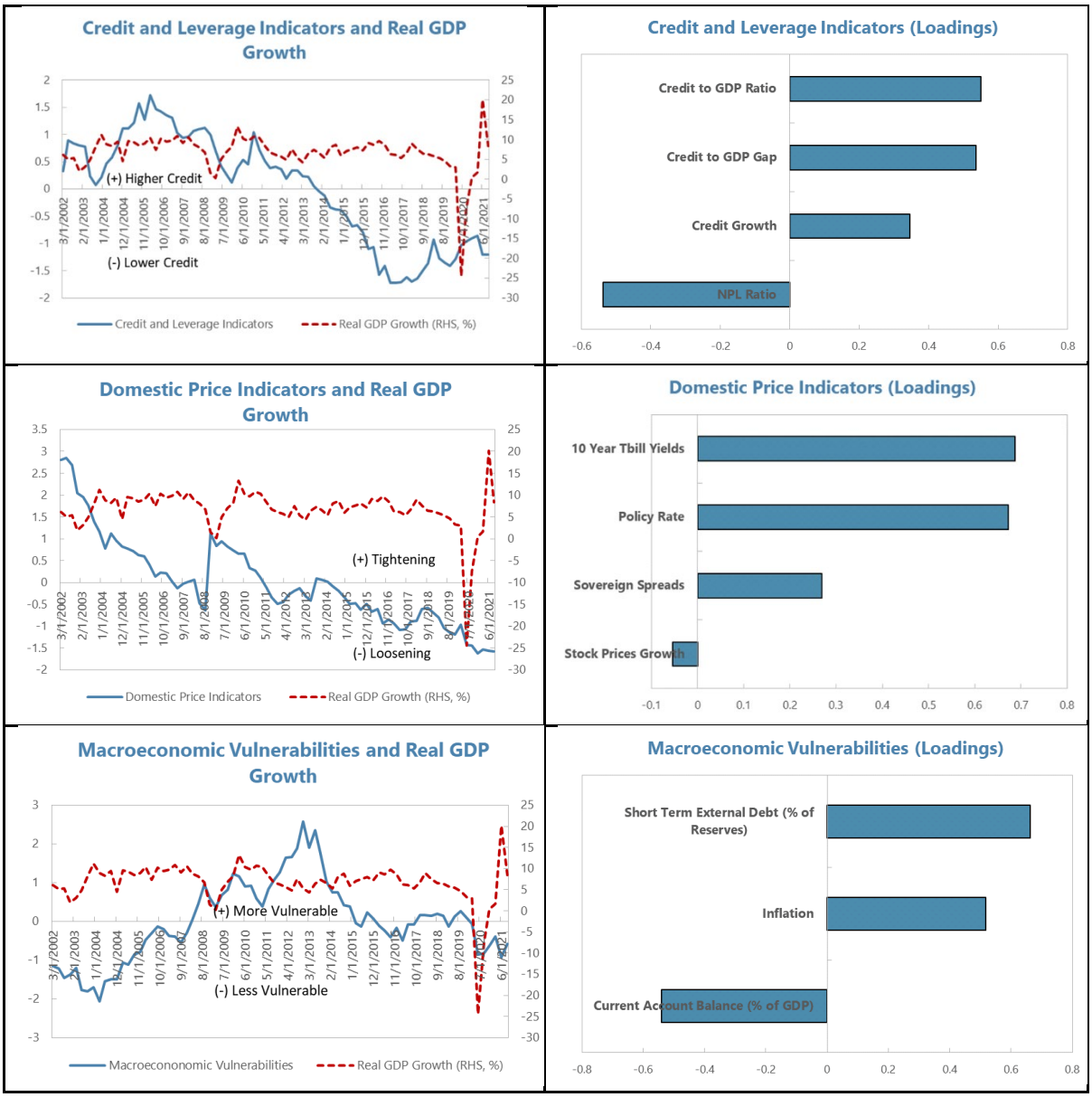
C. Results

Macro-financial Partitions and Loadings

The relationship between different macro-financial partitions and real GDP growth in India is examined. As seen in Figure 2, the credit to GDP ratio, the credit to GDP gap and credit growth have positive loadings on the first principal component3F[4] of credit and leverage indicators, while the NPL ratio has a negative loading. Therefore, an increase in the credit and leverage summary indicator would imply higher credit or more favorable credit conditions. After peaking in 2005/2006, the credit and leverage indicator has been on a downward trend since 2011/2012, coinciding with the period of negative credit to GDP gap.

[4] The first principal component of the credit and leverage partition (comprised of the credit-to-GDP ratio, the credit-to-GDP gap, credit growth, and the NPL ratio) captures 77 percent of the variance.

Figure 2: Macro-Financial Partitions and Loadings



Note: the blue lines in the left-hand-side charts refer to the first principal component of each partition.
Source: IMF Staff estimates.

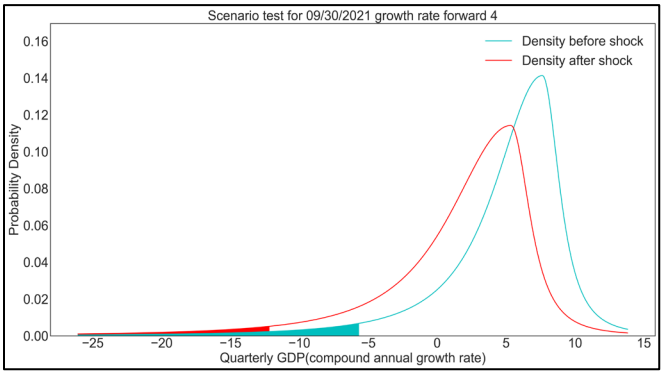
On domestic prices, 10-year treasury bill yields, policy interest rate and sovereign yields have a positive sign in the principal component, while a change in stock prices has a negative loading. An increase in the principal component of domestic prices would then imply a tightening in price-based financial conditions. In the first half of the sample, there was an inverse relationship between real GDP growth and the summary domestic price indicator, where a tightening in the price-based financial conditions is associated with a decline in growth. More recently, there has been a continued loosening of financial conditions, with the link between price-based financial conditions and economic growth less pronounced.

On macroeconomic vulnerabilities, short term external debt and inflation have positive loadings on the principal component, while the current account balance has a negative sign. A rise in the principal component of macroeconomic vulnerabilities would then imply higher vulnerabilities in the economy. Figure 2 shows that macroeconomic vulnerabilities peaked in 2012/13 but has been on a downward trend since then.

Scenario Analysis

A scenario analysis is conducted and considers a two standard deviation negative shock to the credit and leverage partition (Figure 3). A decline in the credit and leverage partition (here, referring to the principal component) would imply a tightening of the credit conditions and a worsening in credit quality, as measured by the NPL ratio. The blue line captures the density before shock and the red line captures the one afterwards. Following the negative shock, the entire distribution of GDP growth would shift to the left. The mode of the 4 quarter ahead GDP growth would decline from 7.6 percent to 5.3 percent. Moreover, the tail risks would increase considerably, with the 5 percent GaR shifting from -5.7 percent to -12.2 percent. In other words, there was a 5 percent probability that growth could be below -5.7 percent prior to the shock. However, after the shock, there is 5 percent probability that growth could be below -12.2 percent, and the probability of growth below -5.7 percent increased to 11 percent, a much more severe tail outcome.

Figure 3: Growth-at-Risk: Shock to Credit and Leverage

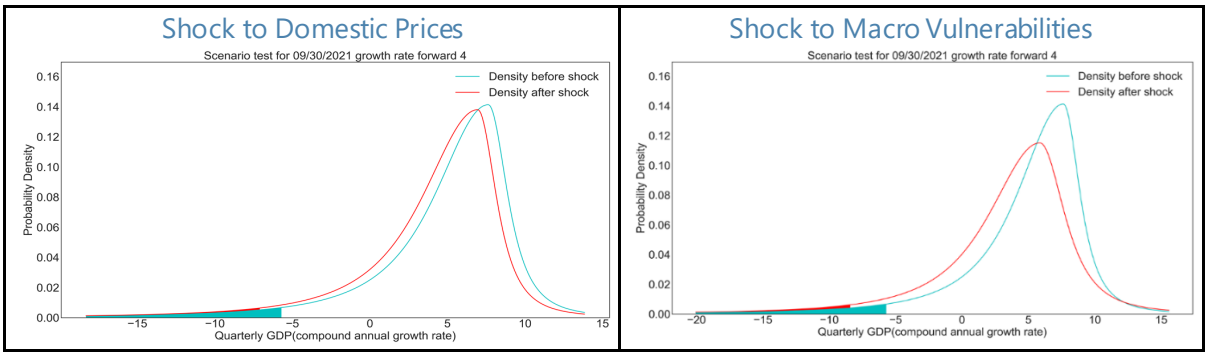


Notes: The results capture a two standard deviation negative shock to the credit and leverage partition, based on a growth-at-risk approach estimated using data from 2001Q4 to 2021Q3. The credit and leverage partition captures the credit to GDP ratio, the credit to GDP gap, credit growth, and the NPL ratio. The first three variables have positive loadings on the principal component, while the last variable has a negative loading.
Source: IMF Staff estimates.

In addition, a two standard deviation positive shock to the domestic prices partition and to the macro vulnerability partition are considered, respectively. An increase in the domestic prices partition would imply a tightening in the price-based financial conditions (Figure 4, left chart). The mode of the 4 quarter ahead GDP growth would decline from 7.6 percent to 7 percent, with a slight shift of the growth distribution to the left following the shock. The relatively milder impact of

the domestic price shock could be potentially attributed to be weaker relationship between domestic prices and growth in recent years. On macroeconomic vulnerabilities (Figure 4, right chart), a two-standard deviation positive shock (higher vulnerabilities) would imply a decline in 4 quarter ahead GDP growth from 7.6 percent to 5.9 percent (mode), with the growth distribution shifted to the left, capturing higher tail risks.

Figure 4: Growth-at-Risk: Shocks to Domestic Prices and Macroeconomic Vulnerabilities

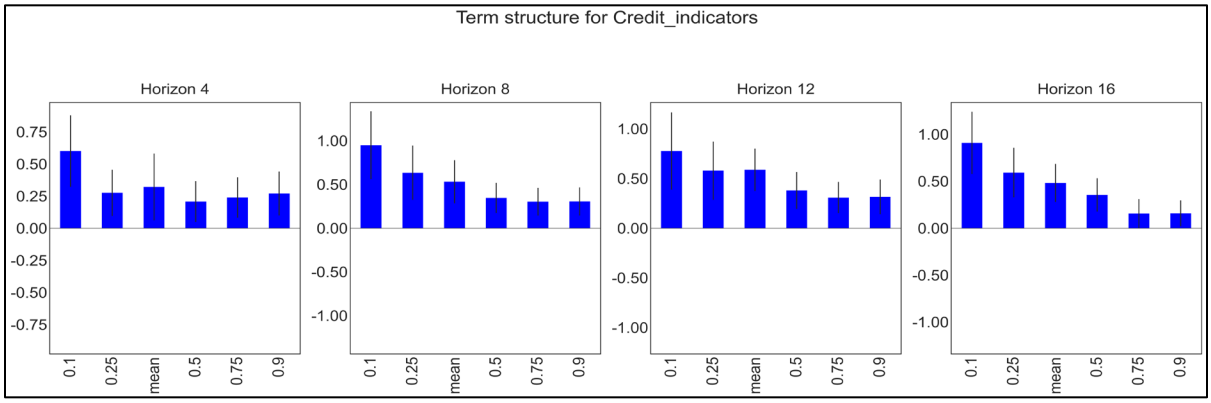


Notes: The left-hand-side chart captures a two standard deviation positive shock to the domestic prices partition, which includes 10-year treasury bill yields, policy interest rate, sovereign yields, and change in stock prices. The right-hand-side chart features a two standard deviation positive shock to the macroeconomic vulnerability partition, which captures short term external debt, inflation, and the current account balance. Both are computed based on the growth-at-risk approach estimated using data from 2001Q4 to 2021Q3. Source: IMF Staff estimates.

Term Structure of Credit and Leverage Indicators

Furthermore, the term structure of the credit and leverage indicators and the impact on GDP growth across different horizons is examined. Specifically, the 4 quarter, 8 quarter, 12 quarter and 16 quarter ahead quantile regression results are considered. In Figure 5, the y-axis refers to the coefficient of the credit and leverage partition in the quantile regression (Equation (1)) and the x-axis refers to the different quantiles, capturing GDP growth at the 10^{th}, 25^{th}, 50^{th}, 75^{th} and 90^{th} percentiles. The results suggest that high credit and low NPLs have a positive and significant impact on GDP growth across all horizons. Furthermore, the impact is even larger at lower quantiles when GDP growth is lower. In other words, a favorable credit condition with higher credit and stronger credit quality is particularly important in supporting the economic recovery during periods of low growth.

Figure 5: Growth-at-Risk: Term Structure for Credit Indicators



Notes: The horizons refer to quarters. The x-axis refers to the different quantiles q of the quantile regression. The y-axis refers to the coefficient β_2^q for the partition of credit and leverage in the quantile regression. The results are based on the growth-at-risk approach estimated using data from 2001Q4 to 2021Q3. Source: IMF Staff estimates.

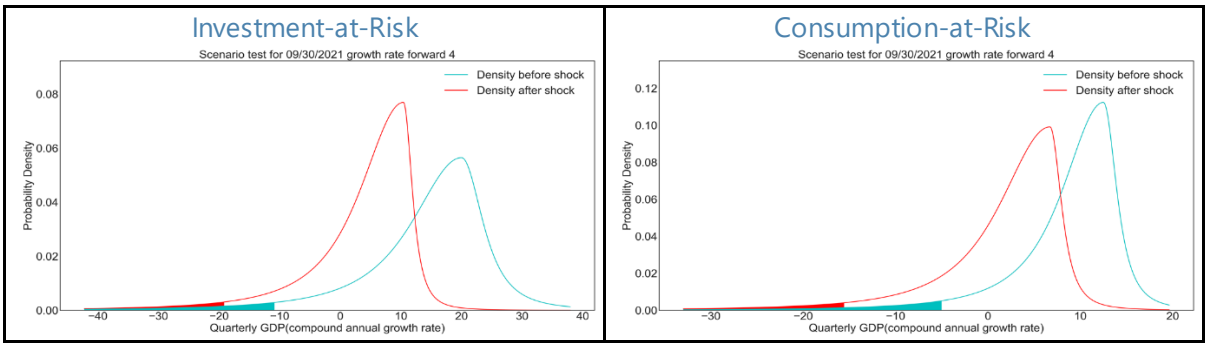
As a robustness check, we also consider an alternative specification focusing on the bank credit to GDP ratio and bank credit growth, instead of the broader concept of credit. The results are found to be robust. A negative shock to the credit and leverage partition would again shift the GDP growth distribution to the left. Higher bank credit and stronger credit quality are particularly supportive to the economy when growth is relatively weak (see Annex Figures 1 and 2).

Investment- and Consumption-at-Risk

Having established the importance of credit and leverage variables for GDP growth, we also examine the extent to which they influence components of GDP growth, such as investment and consumption. In equation (1), we consider y_{t+h}^q as the *h* quarter ahead investment and consumption growth (year-on-year) for quantile q, respectively.

Similar to the aggregate GDP growth, we consider the impact of a two standard deviation negative shock to the credit and leverage partition (Figure 6) on investment and consumption. Following the negative shock, both the distributions of investment and consumption growth would shift to the left. The mode of the 4 quarter ahead investment growth would decline from 20 percent to 10.4 percent, with the 5 percent Investment-at-Risk shifting from -10.9 percent to -19.2 percent. In other words, there was a 5 percent probability that investment growth could be below -10.9 percent prior to the shock. However, after the shock, there is 5 percent probability that growth could be below -19.2 percent, a much more severe tail outcome. For consumption, the mode of the 4 quarter ahead consumption growth would decline from 12.5 percent to 6.7 percent, with the 5 percent Consumption-at-Risk shifting from -5 percent to -15.6 percent, also implying higher tail risks.

Figure 6: Investment-at-Risk and Consumption at Risk: Shock to Credit and Leverage



Notes: The results capture a two standard deviation negative shock to the credit and leverage partition, estimated using data from 2001Q4 to 2021Q3. The credit and leverage partition captures the credit to GDP ratio, the credit to GDP gap, credit growth, and the NPL ratio. The first three variables have positive loadings on the principal component, while the last variable has a negative loading. Source: IMF Staff estimates.

D. Policy Discussions

The results from GaR suggest that higher credit and lower NPLs are associated with higher GDP growth in the near- and medium-term. A negative shock to credit and leverage (lower credit and higher NPL ratio) could shift the distribution of GDP, investment, and consumption growth to the left, with lower expected growth and larger downside risks.

During periods of low economic growth, policies to support credit growth and to strengthen balance sheets would be particularly important. In this regard, policy responses such as credit guarantee schemes for MSMEs, loan restructuring scheme for COVID-affected borrowers were important to support credit growth and cushion the economic impact of the pandemic.

Going forward, further efforts to make support measures even more targeted and facilitate the exit of non-viable firms may be warranted. In addition, financial regulators should continue to ensure that loans benefiting from COVID-related restructuring schemes are closely monitored and properly provisioned for, to safeguard the health of financial sector balance sheets and help support the economic recovery.

III. Financial Sector and Long-Term Growth

Several studies document that poor capitalization and weak asset quality negatively impact banks' ability to provide credit to the economy. Using balance sheet data for international banks from a range of advanced economies, Gambacorta and Shin (2018) show that well-capitalized banks enjoy lower costs of debt financing compared to more leveraged competitors, which in turn translates into higher annual credit growth. Muduli and Behera (2021) find similar evidence in India, of a positive correlation between bank equity and credit growth, and that this plays a role in monetary policy transmission. Blattner et al. (2019) look at a macro-angle and show that less-capitalized banks cut lending in response to higher capital requirements, which potentially contribute to weaker productivity growth. This section of the paper builds on this literature by examining the role of balance sheets of Indian banks on credit growth, and ultimately overall output growth in the economy. The focus is, in particular, on the differential role of public and private banks in driving credit growth.

A. Data and Stylized Facts

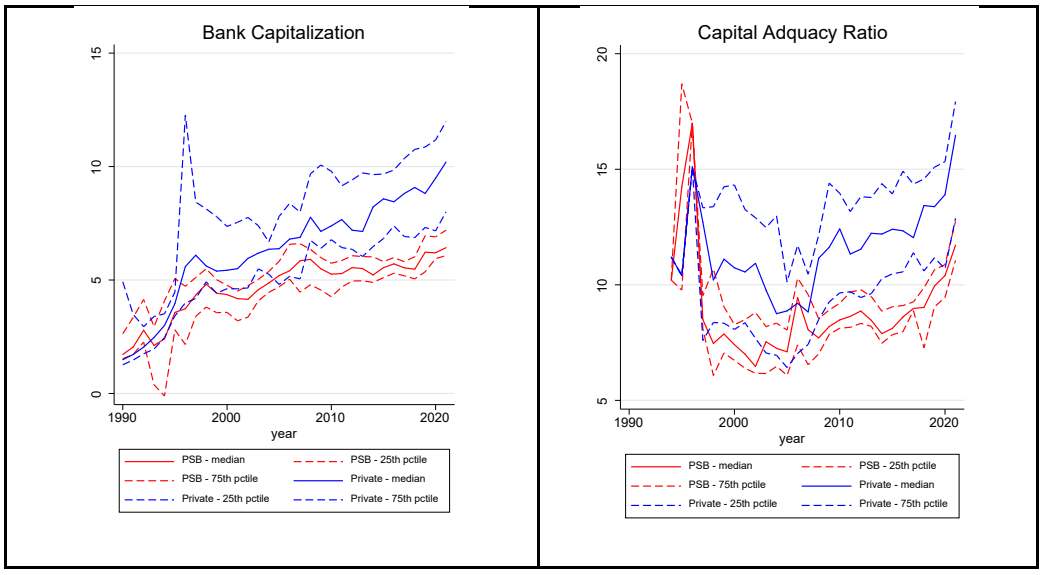
Data for the main bank-level variables of interest (cost of funding, growth of debt funding, credit growth, and bank capitalization) as well as bank-level control variables (non-performing assets, return on assets) are from FitchConnect. The sample is at an annual frequency from 1998-2021. Only public banks and private banks are kept in the sample, excluding such entities as non-bank financial companies, foreign banks and development banks.4F[5] The sample accounts for about 85 percent of total assets in the Indian financial sector in any given year of the sample. For the macro-level analysis, the data on GDP growth and various India-level or global controls are from the Reserve Bank of India via Haver and CEIC. Details of the data and sources are available in Annex Table 2.

The main explanatory variable is bank-level capitalization which, based on existing literature for banks in advanced economies as well as in India, is an important driver of credit growth. Several definitions are considered to determine the robustness of the results. First capitalization is defined in turn as either common equity over total assets, total equity over total assets, or regulatory Tier 1 capital over total assets. The fourth measure of bank-level capitalization is the capital adequacy ratio, defined as Tier 1 regulatory capital over risk weighted assets. Figure 7 shows the path of bank-level capitalization over time for public banks (PSBs) and private banks, as defined by the simple ratio of equity to assets and by the capital adequacy ratio. While median bank capitalization was volatile and slightly higher for private banks in the earlier years of the sample, since 2010 the gap between private and public banks has widened, though both have been trending upwards in recent years. Similarly, there has been a notable upward shift in the capital adequacy ratio since 2012, when India announced its intended adoption of the Basel

[5] We focus on domestic banks only as they have the best data coverage.

III requirements (recommending a 9 percent capital adequacy ratio), aimed to be implemented in 2018-19.[6]

Figure 7: Bank-level capitalization

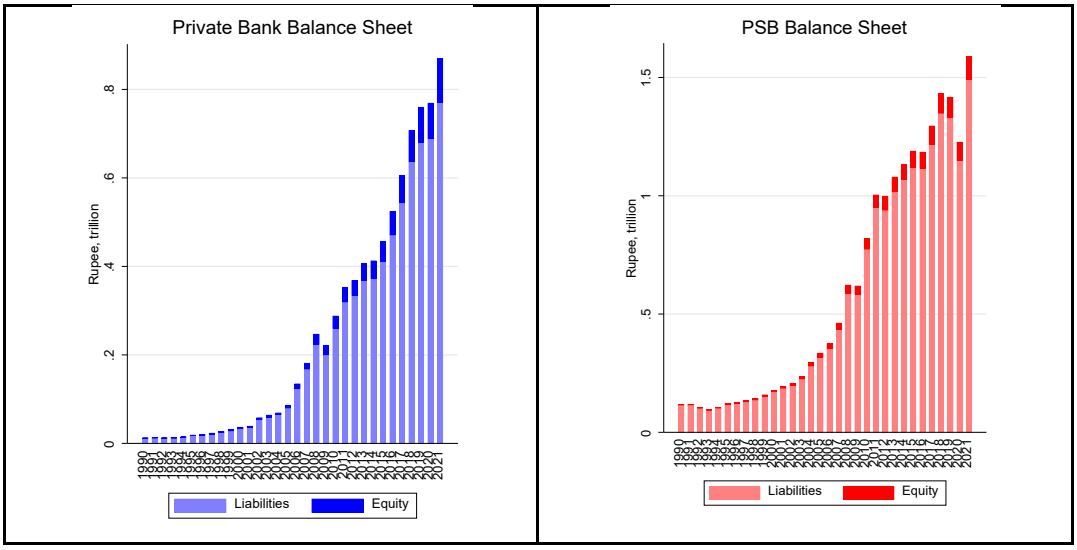


Source: FitchConnect and IMF staff estimates.

Note: Bank capitalization is defined as total equity over total assets. The capital adequacy ratio is defined as Tier 1 regulatory capital over risk weighted assets.

As has been documented in the literature, while banks may use their capital to fund lending, given the relatively low share of capital on their balance sheets it is more likely that lending is funded through debt liabilities. This also appears to be in the case for Indian banks, as depicted in Figure 8, that capital makes up a relatively small share of both private banks and PSBs.

Figure 8: Bank balance sheet composition



Source: FitchConnect and IMF staff estimates.

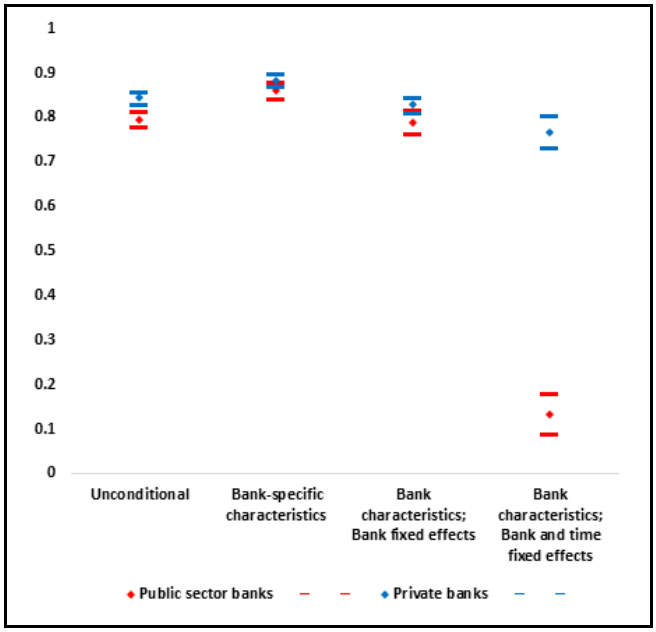
[6] See Seth *et al.* (2022) for a timeline on India's adoption of the Basel recommendations.

At the same time, there is evidence of a relationship between bank equity and bank assets (a large part of which is lending) in India, as has also been identified for other countries (Gambacorta and Shin, 2018). This is shown by estimating the simple correlation between total assets and total equity, both at the bank, *i*, year, *t*, level:

$$\log(asset\,s_{it}) = \alpha_i + \gamma_t + \beta \log(equit\,y_{it}) + \boldsymbol{\delta X} + e_{it} \qquad (2)$$

where the model, in turn, includes the vector $\boldsymbol{X}$ of bank-level control variables (return on assets, NPLs), a set of bank-fixed effects, α_i , and a set of year fixed effects, γ_t. The coefficient β indicates the correlation between bank assets and bank equity, which estimate separately for private banks and PSBs. These correlation estimates are reported graphically in Figure 9. Indeed, the results suggest that for private banks in India there is a correlation between assets and equity close to one, even after including the full set of control variables. That is, as in Gambacorta and Shin (2018) the hypothesis of unit elasticity between the two variables can not be rejected, meaning they move closely together over time. However, given the low share of equity in bank funding, even though equity and assets move closely together it cannot be the case that increases in equity directly result in increases in lending. Furthermore, for PSBs, this correlation is much weaker once aggregate factors that affect all bank assets simultaneously are controlled for (via time fixed effects)., suggesting an even weaker relationship.

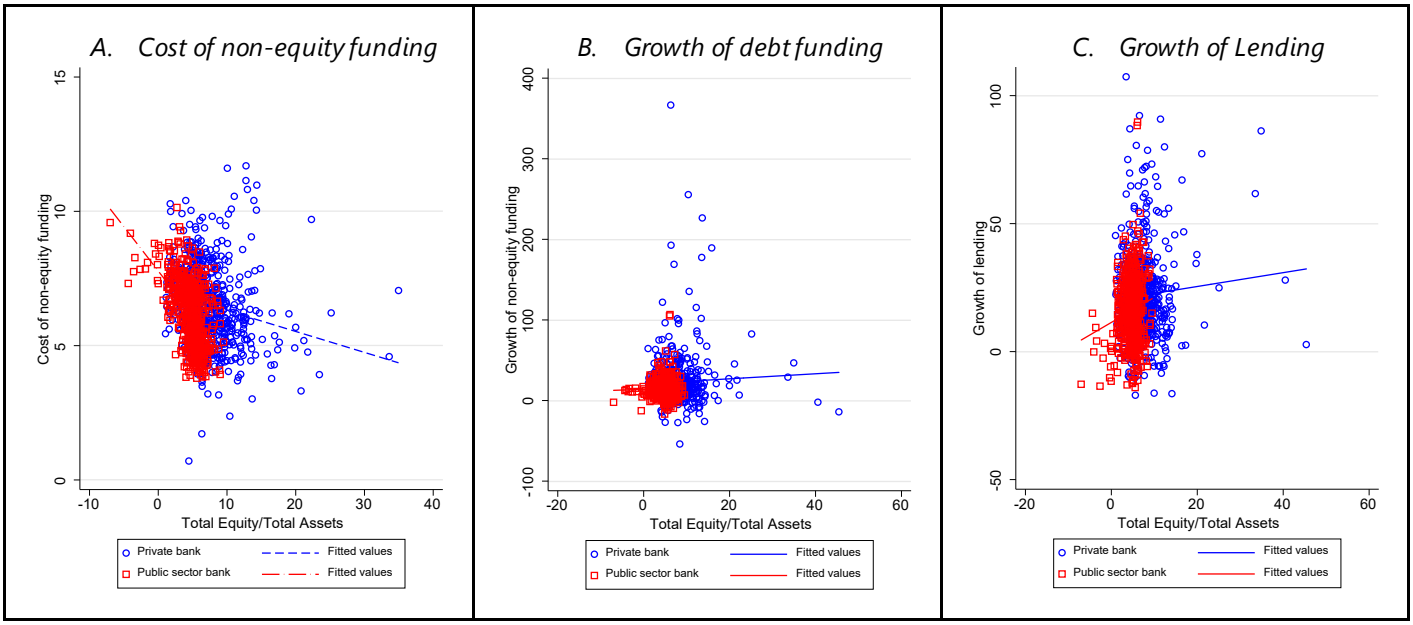
Figure 9: Correlation – Total Assets and Total Equity



Source: FitchConnect and IMF staff estimates.
Note: Correlation estimated via OLS regression. X-axis title indicates control variables included in the regression. Diamonds indicate point estimates, bars indicate the 90 percent (robust) confidence interval.

Having established a strong correlation between bank assets (largely comprised of lending) and bank equity—at least for private banks—the question of whether there is a direct link between the capitalization of Indian banks and their lending growth, via debt funding, is formalized. The analysis proceeds in three steps, following the literature. First, asking whether a bank's capitalization reduces its cost of funding—this is important as it was previously established that most lending is likely stemming from debt funding. Second, investigating whether capitalization not only decreases funding costs, but whether it is actually associated with an increase in debt funding. Figure 10, panels A and B, show these two simple correlations, and suggest that for Indian banks, there is a strong association between higher bank capitalization, lower funding costs, and greater debt funding growth. Finally, as seen in panel C, there is a strong positive correlation between lending growth and capitalization. Together, these suggest that better capitalized banks lend more, possibly through a cheaper debt funding channel. Such a result would be consistent with the existing literature on international banks. In the next section, these relationships are formalized.

Figure 10: Bank capitalization, funding, and lending



Source: Fitch Connect and IMF staff estimates.

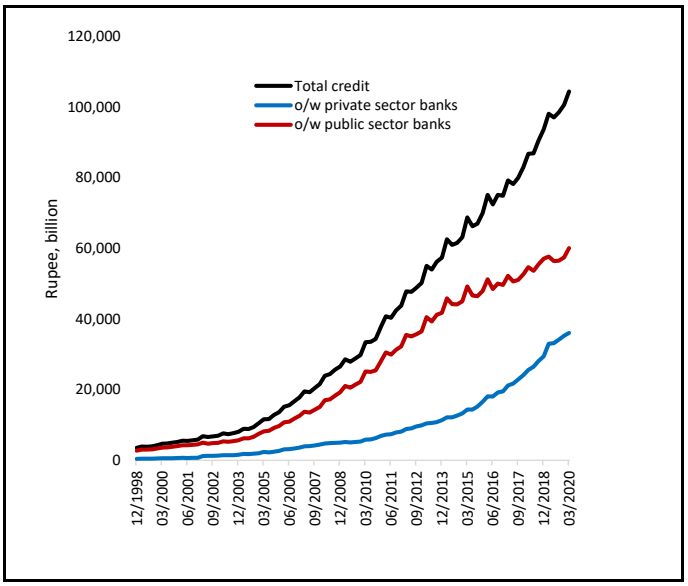
Finally, the paper will look at the macro-level and attempt to formalize the relationship between credit growth with real GDP growth. Because the distinction between public and private banks is made in the bank-level analysis, it is important to also understand how each contributes to aggregate credit growth in India. Figure 11 shows that throughout the period under analysis, public banks have been responsible for the largest share of credit to the economy. However, since around 2013, private bank credit growth has been much faster than public bank credit growth, suggesting private banks are becoming an increasingly important player in the Indian banking sector.

Figure 12 reports the aggregate correlation between real GDP growth and credit growth for each type of bank, with both showing relatively strong positive correlations. This relationship is explored more carefully in the next sections.

B. Methodology

The methodology for the bank-level analysis follows the approach of two closely related papers, Gambacorta and Shin (2018) and Muduli and Behera (2021). It then extends the analysis to the macro-level to analyze the impact of bank lending on real GDP growth in India. The approach will take several stages. First, it examines whether bank capitalization leads to lower debt funding costs and higher debt funding—establishing whether the channel of debt funding for lending also exists in private and public banks in India in the sample period. Then, it turns to lending, to examine whether bank capitalization matters for lending, again distinguishing between private and public banks. Finally, it looks at the aggregate and examines whether bank lending is correlated with higher real GDP growth in India. This latter step raises questions of causality—namely, whether lending boosts real GDP (for instance by increasing consumption and investment) or whether lending rises when real GDP growth is higher. Many papers have tried to tease out this relationship using data from other countries. While this paper has insufficient data to carefully establish causality (only a correlation), it will nonetheless argue that the approach suggests there is a likely channel of transmission from bank lending to real GDP growth in India.

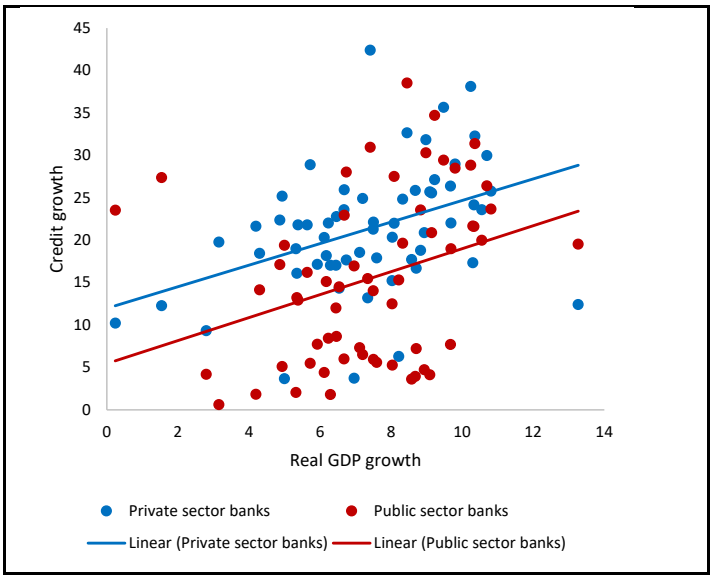
Figure 11: Aggregate bank credit to the economy



Source: CEIC and author's calculations.

Note: Public bank credit is the sum of nationalized bank credit and State Bank of India credit for the period before 06/2017.

Figure 12: Real GDP growth and credit growth



Source: CEIC and author's calculations.
Note: Public bank credit is the sum of nationalized bank credit and State Bank of India credit for the period before 06/2017.

To estimate the role of bank capitalization on funding costs, debt funding costs of bank *i* in period *t*, $cost_{it}$, defined as the average cost of funding given by total interest rate paid over total level of debt (excluding equity and reserves), is regressed on bank capitalization ($Capitalization_{it-1}$), using various definitions described in the previous section. Time fixed effects and bank level controls, $\boldsymbol{X_{it-1}}$, including return on assets, total assets, and the NPL ratio, are also included:

$$cost_{it} = \theta_t + \beta cost_{it-1} + \lambda Capitalization_{it-1} + \boldsymbol{\delta X_{it-1}} + e_{it} \quad (3)$$

The model is estimated using the dynamic Generalized Method of Moments (GMM) estimator (Arellano and Bond, 1991), which ensures efficiency and consistency of the estimates. This is useful in this setting since the outcome variable likely depends on past realizations of itself. It is important to note that while this regression model can inform on the relationship between bank capitalization and funding costs, it cannot identify a causal relationship between these variables. Consistent with existing literature, it is expected that the results will show that lower capital levels are associated with higher prices for debt funding (*i.e.* higher equity reduces the cost of debt or that well capitalized banks pay less for their funding).

Having established a link between bank capitalization and the cost of funding, the analysis then estimates the impact of bank capitalization on funding levels, using a similar set-up, with the dependent variable this time the growth of debt funding, $fund s_{it}$:

$$\Delta \ln(fund s_{it}) = \alpha_i + \theta_t + \beta \Delta \ln(fund s_{it-1}) + \lambda Capitalization_{it-1} + \boldsymbol{\delta X_{it-1}} + e_{it} \quad (4)$$

In this case, it is expected that better capitalization and an increase in asset quality will increase the rate of debt funding.

The final step in the bank-level analysis estimates the impact of bank capitalization on credit supply, again in a similar setup as equations (3) and (4):

$$\Delta \ln(loans)_{it} = \alpha_i + \theta_t + \beta \Delta \ln(loans)_{it-1} + \lambda Capitalization_{it-1} + \boldsymbol{\delta X_{it-1}} + e_{it} \quad (5)$$

In this case, it is expected that better capitalization increases the growth rate of loans.

As a robustness exercise, the models in equations (3) -(5) are estimated via panel fixed effects estimation, which allow for the inclusion of both year and bank time fixed effects. The results for these exercises are reported in Annex Table 3-6.

With bank-level results established, the analysis turns to addressing the question of what the relationship between banking lending, through bank balance sheets, is with the macroeconomy in India. This remains an open question because, while there is evidence that higher credit growth is often associated with higher GDP growth, in emerging markets this is sometimes the result of a boom-bust cycle which can ultimately lead to lower growth. In such a case, it may indeed be that the health of bank balance sheets is particularly important to avoid these extreme swings. Also motived by the results from the GaR model, a measure of balance sheet health is controlled for directly, defined using the NPL ratio. The following regression model is estimated to determine the relationship between real GDP growth and credit growth (at the bank-year, *it,* level) in India:

$$Real\ GDP\ Growth_t = \alpha + \beta_1 Credit\ Growth_{it-1} + \beta_2 NPL_{it-1} + \beta_3 Credit\ Growth_{it-1} \cdot NPL_{it-1} + \beta_4 Controls_t + e_{it} \quad (6)$$

where the set of control variables are macro controls, including inflation, the real effective exchange rate, and world GDP growth. NPLs are defined as a dummy variable, equal to one if bank *i's* NPL ratio in year *t* is below the sample mean. Credit growth, in turn, is defined as actual credit growth or as a dummy variable for high credit growth equals to one if bank *i's* credit growth ratio in year *t* is above the sample mean. The credit growth variable is also winsorized at the 1st and 99th percentile, to account for extreme outliers.6F[7] Given the potential endogeneity between credit growth and GDP growth, this regression is unable to identify a causal relationship between the two variables but rather speaks to their correlation. Furthermore, given that we examine output growth at the aggregate level (GDP growth) we are estimating an average effect of credit growth over all bank characteristics – for instance, type of bank (public versus private) and size of bank. We address this averaging effect by examining split samples along various characteristics. With these caveats in mind, the next section presents the results.

[7] Results are robust to not winsorizing and available upon request.

C. Results

The first results, based on estimating equation (4), are reported in Table 2. The sample is split between public banks (columns 1 to 4) and private banks (column 5 to 8) and results are shown for the four different measures of bank capitalization. The results suggest that higher capitalization is associated with lower debt funding costs, especially and more so for private banks. This is consistent with what Gambacorta and Shin (2018) find for advance country banks. Muduli and Behera (2021) find a related, nuanced result for India, that (consistent with the results presented in this paper) a higher level of bank capital is associated with lower funding costs but for public banks it is only associated with lower funding costs if they have lower non-performing assets. In contrast, the results here indicate there is some negative association on average, regardless of the level of NPLs, but it is not as strong as for private banks. This could be because public banks often get public capital infusions, thus limiting the extent to which capital is indicative of risk for public banks.

Table 2. Bank capitalization and cost of debt funding

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Cost of funding							
	PSBs				***Private Banks***			
Leverage Ratio (total equity/assets)	-0.0241				-0.0521***			
	(0.0176)				(0.0124)			
Leverage Ratio (common equity/assets)		-0.0206				-0.0494***		
		(0.0164)				(0.0123)		
Leverage Ratio (tier 1/assets)			-0.0248				-0.0531***	
			(0.0528)				(0.0155)	
Capital Adequacy Ratio				-0.0177				-0.0260***
				(0.0138)				(0.00777)
N	373	373	157	363	408	408	229	402
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses, * p<0.05, ** p<0.01, *** p<0.001. Sample period from 1998-2021. Model estimated using the dynamic GMM panel.

Next, the analysis asks whether capitalization matters for the overall growth of debt funding. The results for estimating this, as indicated in equation (5), are reported in Table 3, again separately analyzing public and private firms. Again, there is a similar distinction between the role of capitalization in public versus private banks. Private banks that have greater capitalization are associated with large, and significantly greater debt funding growth. For public banks, the relationship is less robust across the different measures of capitalization but there does seem to be a positive, albeit smaller, relationship.

Table 3. Bank capitalization and debt funding growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Growth in debt funding							
	PSBs				***Private banks***			
Leverage Ratio (total equity/assets)	1.393***				2.276***			
	(0.341)				(0.456)			
Leverage Ratio (common equity/assets)		1.151***				2.205***		
		(0.321)				(0.451)		
Leverage Ratio (tier 1/assets)			0.529				4.755***	
			(1.006)				(0.686)	
Capital Adequacy Ratio				0.947***				1.393***
				(0.256)				(0.323)
N	373	373	157	363	406	406	228	399
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses, * p<0.05, ** p<0.01, *** p<0.001. Sample period from 1998-2021. Model estimated using the dynamic GMM panel.

The above established that better capitalized Indian (private) banks are able to find cheaper debt funding and raise more funds relative to less well capitalized banks, and this can be a source of funds for lending. The final exercise is to examine banks' lending practices directly. Table 4 reports results from estimating equation (6). With respect to private banks, there is some evidence of a positive relationship between capitalization and lending. For public banks, no such evidence is found. Isolating the period from 2010-21, which is both when the RBI adopted the Basel II regulations and when private banks became much more prominent in India, delivers an even stronger positive relationship between capitalization and lending, as shown in Table 5. Together, the results suggest that credit growth in India can be supported by ensuring banks are adequately capitalized, which enables them to raise more debt funding, at cheaper rates, which is then ultimately used to support lending growth. This relationship is, however, specific to private banks and does not seem to hold for public banks, which may have different funding models and different ability to lend.

Turing to the macro-level results, reported in Table 6, columns (3) and (4) suggest that there is a strong positive correlation between higher credit growth and real GDP growth, but only for those banks with a low NPL ratio. Furthermore, this result appears to be entirely driven by private banks (column (5)), with public banks (column (6)) showing no relationships between credit growth and real GDP growth regardless of the level of NPLs. Finally, the size of the bank (column (7)) does not appear to be related to whether credit growth is associated with higher GDP growth. [8]

[8] The results for bank size are robust to defining a large bank as those with total assets in the top 25 and top 10 percent of the distribution of banks' total assets.

Table 4. Bank capitalization and lending growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Growth of gross loans							
	PSBs				***Private banks***			
Leverage Ratio (total equity/assets)	0.371				0.630			
	(0.392)				(0.484)			
Leverage Ratio (common equity/assets)		0.259				0.639		
		(0.366)				(0.480)		
Leverage Ratio (tier 1/assets)			0.0703				1.970**	
			(1.102)				(0.798)	
Capital Adequacy Ratio				0.369				0.805**
				(0.294)				(0.349)
N	373	373	157	363	406	406	228	399
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses, * p<0.05, ** p<0.01, *** p<0.001. Sample period from 1998-2021. Model estimated using the dynamic GMM panel.

Table 5. Bank capitalization and lending growth, 2010-21

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Growth of gross loans							
	PSBs				***Private banks***			
Leverage Ratio (total equity/assets)	2.681**				2.200***			
	(1.148)				(0.570)			
Leverage Ratio (common equity/assets)		3.024**				1.970***		
		(1.220)				(0.562)		
Leverage Ratio (tier 1/assets)			-0.101				1.957***	
			(1.527)				(0.507)	
Capital Adequacy Ratio				0.432				1.369***
				(0.888)				(0.335)
N	166	166	130	165	198	198	175	197
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses, * p<0.05, ** p<0.01, *** p<0.001. Sample period from 2010-2021. Results for sample period 1990-2010 available in appendix or upon request.

Table 6. Real GDP Growth and Credit Growth

	Sample period 1990-2021						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable:	*Real GDP Growth*						
	Full sample				*Private Banks*	*PSBs*	*Large banks*
Credit Growth	0.0421***	0.0105					
	(0.00949)	(0.0183)					
NPL Ratio Low		0.258	0.232	0.884*	0.376	3.069***	1.402
		(0.488)	(0.352)	(0.519)	(0.755)	(0.762)	(0.866)
Credit growth*NPL Ratio Low		0.0325					
		(0.0222)					
Credit growth high (dummy)			-0.196	-1.532	-1.861	-0.610	-2.352
			(0.389)	(0.936)	(1.341)	(1.399)	(1.582)
Credit growth high (dummy)*NPL Ratio Low			1.771***	1.797*	2.942**	-0.00683	2.206
			(0.486)	(0.961)	(1.402)	(1.345)	(1.660)
Inflation				-0.293***	-0.336***	-0.411***	-0.620***
				(0.0615)	(0.0898)	(0.0894)	(0.164)
Real effective exchange rate (RBI)				-0.199***	-0.263***	-0.0682	-0.343***
				(0.0330)	(0.0460)	(0.0517)	(0.0998)
World GDP				0.348***	0.358***	0.318***	0.406***
				(0.0276)	(0.0374)	(0.0403)	(0.0563)
Constant	5.753***	5.727***	5.807***	25.73***	32.00***	13.01**	41.78***
	(0.237)	(0.340)	(0.237)	(3.405)	(4.740)	(5.298)	(10.61)
N	807	807	824	588	309	279	221
R-sq	0.035	0.051	0.069	0.381	0.410	0.412	0.382

Robust standard errors in parentheses, * p<0.1, ** p<0.05 *** p<0.01. Credit growth is winsorized at 1 and 99 percent. Low NPL ratio is defined has NPL ration below the sample mean. High credit growth is defined as credit growth above the (winsorized) mean of the full sample. Large banks are defined as banks with total assets above the mean of the full sample.

While the methodology used here cannot speak to the reason for the lack of relationship between public banks' lending and growth, the reasons could be varied: public banks may have different objectives than private banks, and often engage in directed lending (also known as priority sector lending); the results could also reflect implicit guarantees that public banks have from the government. The result is also consistent with a large literature that finds publicly owned banks are generally associated with lower employment and growth (see, for instance, Carvalho, 2014 and La Porta *et al.,* 2002). If real GDP growth is the overarching objective, then the results suggest private bank lending by banks with healthy balance sheets should be promoted. There may nonetheless be alternative reasons for continuing to promote public bank lending. It is also important to recall that this methodology does not speak to a causal relationship between bank lending and real GDP growth. The positive correlation may imply that private bank credit growth from banks with low NPLs spurs real growth, but it may also indicate procyclical lending by private banks (and countercyclical lending by public banks). Further analysis with micro-level

data would be needed to disentangle this relationship, which is left to future research. Finally, the results presented here abstract from any lending by non-banks, which represent a large share of credit in India and may themselves also be important for real GDP growth. [9]

D. Policy Implications

Results from this panel regression analysis, as with the results from the GaR, highlight the importance of ensuring adequate credit growth and improving bank balance sheets, particularly through reducing NPLs, to boost growth. It is only those banks with low NPLs and high credit growth that are associated with higher GDP growth.

At the bank level, to ensure high credit growth, it is also imperative that banks are well capitalized. This allows them access to more and cheaper debt funding, which is in turn used to fund lending. These relationships, however, seem to exist primarily for private banks. Public banks, which may have different motivations for lending, appear to be less affected by their capital position in terms of their ability to lend.

Looking ahead, efforts to clean up bank balance sheets and boost capitalization—especially for private banks—will be critical in boosting credit growth, and thus GDP growth over the medium term.

IV. Conclusions

This paper has examined the nexus between India's financial sector and economic growth. It highlights the important role of financial sector on growth outcomes. Using two distinct methodologies, the results provide consistent messages. On a cyclical basis, a negative shock to credit and leverage or a rise in macro vulnerability all shift the distribution of growth to the left, with lower expected growth and higher negative tail risks, implying lower expected growth and higher downside risks. Over the long term, the results indicate that higher credit growth, arising from better capitalized banks with lower NPLs, is associated with higher GDP growth.

Together, these results point to several policy considerations. First, the results highlight the importance of ensuring adequate credit growth and improving the balance sheets of banks, particularly through reducing problem loans. During periods of low economic growth, policies to support credit growth and to strengthen balance sheets would be particularly important. Additionally, a focus on ensuring that private banks are well capitalized, either through new equity issuance or reducing cash dividends, is crucial, given the relationship between their balance sheets and credit to the economy. Finally, given the differences in results between private and public banks, efforts to better understand the drivers of this difference and address it could help promote growth.

[9] Results for foreign banks are presented in Annex Table 7. While generally robust to the main results on private sector banks, the sample of foreign banks is relatively small, and thus difficult to assess with any precision the quality of the results.

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Annex I. Tables

Annex Table 1: Definitions and Data Sources of Macro-Financial Variables

Variables	Definitions	Sources
Real GDP Growth	Real GDP at Market Prices, % Change - YoY	Haver Analytics/ Central Statistics Office
Policy Rate	Repo Rate (EOP, % per annum)	Haver Analytics/ Reserve Bank of India
Treasury bill yields (10 year)	10-Year Government Bond Yield (EOP, % per annum)	Haver Analytics/ Reserve Bank of India
Sovereign spreads	JPSSGINB Index	Bloomberg
Stock price change	Stock Prices: BSE Sensex/BSE 30 Index (% YoY)	Haver Analytics/Bombay Stock Exchange
Inflation Rate	Consumer Price Index % Change - YoY	Haver Analytics/ Ministry of Statistics and Programme Implementation
Current account deficit	BOP: Current Account Balance / Real GDP at Market Prices	Haver Analytics/ Central Statistics Office and Reserve Bank of India
Short term external debt to reserve ratio	Short-Term Gross External Debt / Intl Liquidity Reserves	Haver Analytics/ Reserve Bank of India
NPL ratio	Non-Performing Loans to Total Gross Loans (EOP, %)	Haver Analytics/ International Monetary Fund
Credit growth	Adj Credit by All Sectors to Nonfin Priv Sector (% YoY)	Haver Analytics/ Bank of International Settlements
Credit to GDP Ratio	Adj Credit to the Private Nonfinancial Sector (% of GDP)	Haver Analytics/ Bank of International Settlements
Credit to GDP gap	Private Nonfinancial Credit to GDP Gap (EOP, %)	Haver Analytics/ Bank of International Settlements
World GDP growth	Real GDP, seasonally adjusted, % YoY, World	International Monetary Fund, World Economic Outlook
Oil price change	West Texas Intermediate ($/Barrel) (% YoY)	Haver Analytics/ Energy Information Admin/Chicago Mercantile Exch
Exchange rate change	India: Rupee/US$ Exchange Rate (AVG) (% YoY)	Haver Analytics/ Reserve Bank of India

Annex Table 2: Definitions and Data Sources of Panel Regression Variables

Variable	Definition	Source
Leverage ratio (total equity)	Total equity divided by total assets (%)	FitchConnect/Reserve Bank of India
Leverage ratio (common equity)	Total common equity divided by total assets (%)	FitchConnect/Reserve Bank of India
Leverage ratio (Tier1)	Tier 1 capital divided by total assets (%)	FitchConnect/Reserve Bank of India
Capital adequacy ratio	Tier 1 capital divided by risk-weighted assets (%)	FitchConnect/Reserve Bank of India
Cost of funding	Total interest expense divided by total debt funding excluding derivatives	FitchConnect/Reserve Bank of India
Debt funding growth	Growth rate of debt funding	FitchConnect/Reserve Bank of India
Growth of gross loans	Growth rate of gross loans (%)	FitchConnect/Reserve Bank of India
Return on assets	Net income divided by total assets (%)	FitchConnect/Reserve Bank of India
NPL	Total impaired loans divided by gross loans	FitchConnect/Reserve Bank of India
GDP growth	Real GDP growth (%)	International Monetary Fund
Policy rate	Repo rate (average %)	Haver/Reserve Bank of India
Real effective exchange rate	Real effective exchange rate against 10 currency basket	Haver/Reserve Bank of India
Exchange rate	Rupee/USD exchange rate, nominal	Haver/Reserve Bank of India
US Policy rate	Effective Fed Funds Rate	Haver

Annex Table 3. Bank capitalization and cost of debt funding

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Cost of funding							
	PSBs				***Private Banks***			
Leverage Ratio (total equity/assets)	-0.0399**				-0.0208**			
	(0.0189)				(0.00975)			
Leverage Ratio (common equity/assets)		-0.0299*				-0.0185*		
		(0.0170)				(0.0102)		
Leverage Ratio (tier 1/assets)			-0.0249				-0.0605***	
			(0.0567)				(0.0196)	
Capital Adequacy Ratio				-0.0205				-0.0229**
				(0.0144)				(0.00999)
N	392	392	181	384	434	434	248	426
R2	0.877	0.876	0.875	0.872	0.777	0.777	0.819	0.783
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses, * p<0.05, ** p<0.01, *** p<0.001. Sample period from 1998-2021.

Annex Table 4. Bank capitalization and debt funding growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Growth in debt funding							
	PSBs				***Private banks***			
Leverage Ratio (total equity/assets)	1.035**				1.821			
	(0.477)				(1.212)			
Leverage Ratio (common equity/assets)		0.791*				1.762		
		(0.468)				(1.186)		
Leverage Ratio (tier 1/assets)			2.100*				4.794***	
			(1.253)				(1.430)	
Capital Adequacy Ratio				0.649*				1.212
				(0.339)				(0.835)
N	392	392	181	384	433	433	248	426
	0.580	0.578	0.736	0.579	0.293	0.292	0.577	0.290
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses, * p<0.05, ** p<0.01, *** p<0.001. Sample period from 1998-2021.

Annex Table 5. Bank capitalization and lending growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Growth of gross loans							
	PSBs				***Private banks***			
Leverage Ratio (total equity/assets)	0.143				0.666			
	(0.463)				(0.605)			
Leverage Ratio (common equity/assets)		0.166				0.682		
		(0.457)				(0.581)		
Leverage Ratio (tier 1/assets)			2.145				1.826*	
			(1.346)				(1.026)	
Capital Adequacy Ratio				0.431				0.741*
				(0.327)				(0.434)
N	392	392	181	384	433	433	248	426
R2	0.640	0.640	0.716	0.645	0.239	0.239	0.575	0.236
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses, * p<0.05, ** p<0.01, *** p<0.001. Sample period from 1998-2021.

Annex Table 6. Bank capitalization and lending growth, 2010-21

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Growth of gross loans							
	PSBs				***Private banks***			
Leverage Ratio (total equity/assets)	2.149*				2.276***			
	(1.121)				(0.624)			
Leverage Ratio (common equity/assets)		3.499***				2.112***		
		(1.280)				(0.644)		
Leverage Ratio (tier 1/assets)			1.870				1.990***	
			(1.572)				(0.675)	
Capital Adequacy Ratio				0.0812				1.407***
				(0.927)				(0.299)
N	185	185	157	184	224	224	196	222
R2	0.701	0.710	0.707	0.692	0.648	0.644	0.673	0.656
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses, * p<0.05, ** p<0.01, *** p<0.001. Sample period from 1998-2021.

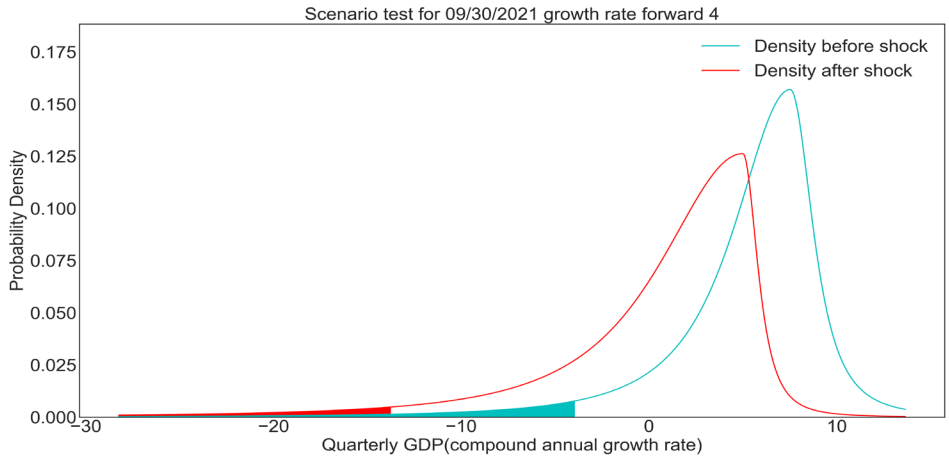
Annex Table 7. Foreign bank capitalization and funding costs, debt, and lending growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Cost of funding				*Growth in debt funding*				*Growth of gross loans*			
	Foreign Banks				***Foreign Banks***				***Foreign Banks***			
Leverage Ratio (total equity/assets)	-0.0275				6.603***				73.88***			
	(0.0173)				(1.186)				(20.12)			
Leverage Ratio (common equity/assets)		-0.0253				6.570***				73.40***		
		(0.0173)				(1.181)				(20.17)		
Leverage Ratio (tier 1/assets)			-0.139**				2.980**				2.085	
			(0.0581)				(1.480)				(1.390)	
Capital Adequacy Ratio				0.00960				-0.127				-7.719
				(0.0207)				(1.473)				(19.36)
N	86	86	55	83	79	79	52	78	79	79	52	78
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses, * p<0.05, ** p<0.01, *** p<0.001. Sample period from 1998-2021. Model estimated using the dynamic GMM panel.

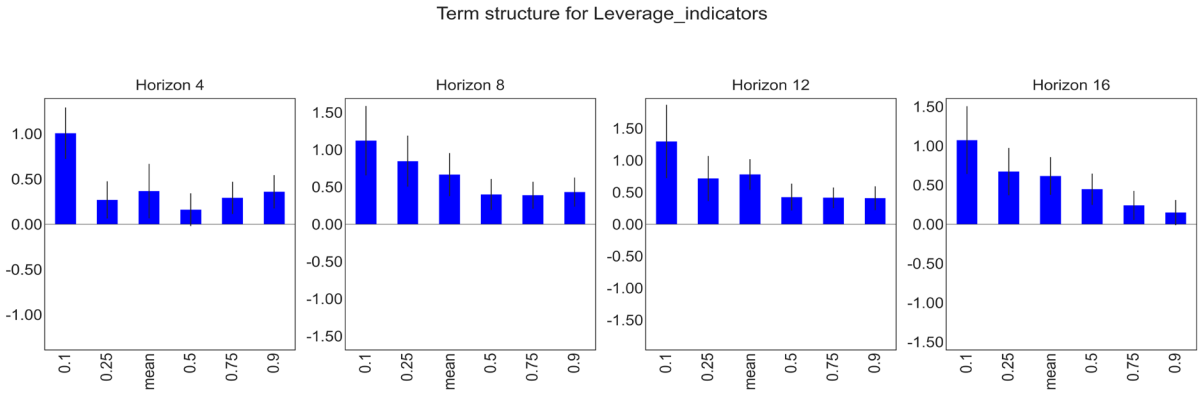
Annex II. Figures

Annex Figure 1: Robustness Check - Growth-at-Risk: Shock to Credit and Leverage (Bank Credit)



Notes: The results capture a two standard deviation negative shock to the credit and leverage partition (bank credit only), based on a growth-at-risk approach estimated using data from 2001Q4 to 2021Q3. The credit and leverage partition captures the bank credit to GDP ratio, bank credit growth, the credit to GDP gap, and the NPL ratio. The first three variables have positive loadings on the principal component, while the last variable has a negative loading. Source: IMF Staff estimates.

Annex Figure 2: Robustness Check - Growth-at-Risk: Term Structure for Credit Indicators (Bank Credit)



Notes: The horizons refer to quarters. The x-axis refers to the different quantiles q of the quantile regression. The y-axis refers to the coefficient β_2^q for the partition of credit and leverage (bank credit only) in the quantile regression. The credit and leverage partition captures the bank credit to GDP ratio, bank credit growth, the credit to GDP gap, and the NPL ratio. The results are based on the growth-at-risk approach estimated using data from 2001Q4 to 2021Q3. Source: IMF Staff estimates.

PUBLICATIONS

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