



Disentangling demand and supply side determinants of post-GFC credit slowdown: an Indian perspective

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Abstract

In an emerging market economy (EME) that depends largely on bank-credit, it is important to decipher whether supply-side or demand-side factors are responsible for a sluggish credit growth phase. A formal empirical analysis using Indian data and a disequilibrium model suggests that demand side factors have majorly contributed to the credit slowdown during the post-GFC period and prior to the pandemic. This could be because of adequate supply of funds, and several concerted policy actions taken by the regulatory authorities to mitigate concerns over the asset quality risks. In contrast, lower investment demand and global supply side bottlenecks have often contributed to demand side weaknesses, suggesting the need for strong policy support to uphold credit demand.

Keywords Bank credit · Financial intermediation · Credit demand · Disequilibrium model

JEL Classification E02 · E44 · E58 · G21 · G23

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1 Introduction

Credit growth in India witnessed a boom in the early 2000s before slowing down subsequently. The anaemic trend became sharper since global financial crisis (GFC), culminating into mostly single digit, range-bound growth in bank advances during 2015–2021. Although the recent period witnessed some green shoots in credit growth, a key to sustaining this growth remains in understanding what led to the chronic credit slowdown during the previous period. It is pertinent to ask whether the slowdown was a result of demand side constraints or supply side bottlenecks.

Several agents and organisations are involved in credit creation. As savers and providers of capital, households are the key suppliers of loanable funds, while the financial intermediaries allocate the funds for productive purposes. On the other hand, businesses are major players on the demand side, needing funds for both operating expenses and new investments. Households too, seek credit to smoothen their consumption over the business cycle.

The strength of the balance sheet of the financial intermediaries is a key component in their capacity to supply credit to households and firms, as established in conventional banking literature. Therefore, if credit deceleration is supply driven, the causal factors can be traced to risk aversion of banks coupled with trend shifts in savings, and monetary/regulatory measures may be necessary to reinvigorate credit markets. On the other hand, if credit flow sluggishness is due to lower demand for loans in the face of lower business activity and investment demand, policies aimed at increasing aggregate demand may be more effective in stimulating credit growth.

The main contribution of this article is disentangling the supply side forces from the demand side factors affecting credit growth and then empirically identifying the dominant factors that have majorly contributed to the credit slowdown during the period prior to the COVID-19 pandemic. Before delving into specifics, the article presents a bird's eye view of the economic literature examining the interrelationship between credit supply and demand in Sect. 2. The supply side factors governing credit are savings of the households and corporate sector, and the state of financial intermediation. Trends in savings are analysed in Sect. 3. Section 4 evaluates the role of banking vis-a-vis other sources of finance in meeting the credit needs of the economy. Coming to the demand side, Sect. 5 discusses recent trends in firm borrowing and evaluates the reasons for the recent slowdown in deleveraging and decline in investments. In Sect. 6, these trends are validated using an empirical exercise wherein we closely follow Carasco and Mukhopadhyay (2014) approach to shed light on the recent periods, further finetuning the demand and supply side variable selections in line with the available literature. Finally, Sect. 7 concludes by offering a discussion on the way forward.

2 Credit and economy: theory and trends

A vast body of literature has emphasised on the inter-connections between credit, economic fluctuations and their endogenous feedbacks. Institutional credit plays a crucial role in propelling economic activity. On the other hand, worsening of

macroeconomic conditions result in loan losses, requiring higher provisioning, which adversely affects lenders' capital buffers and profits. In a downturn, thus, the risk-taking abilities of banks are eroded which may potentially result in tightening of credit supply. Although lenders can insure themselves against idiosyncratic risks of defaults by diversifying their loan portfolio, this strategy does not provide protection against systemic risks (Bolt et al., 2012; Borio & Zhu, 2012). This mutually reinforcing feedback loop can amplify business-cycle fluctuations (Van den Heuvel, 2002). The dynamic stochastic general equilibrium (DSGE) strand of literature also analyses the effect of credit market frictions and the interaction between the real and financial sector through the balance sheet of banks and other financial intermediaries (Gerali et al., 2010; Gertler & Karadi, 2011).

Credit is procyclical and during growth downturns, providing policy induced liquidity support is the first line of policy reactions initiated by central banks around the world. During times of heightened stress, policy makers also employ a combination of interventions—including recapitalisation of banks, mergers, and consolidations, tweaking of restructuring norms, and performing the lender of last resort (LoLR) function—to reinforce trust and thereby ensure smooth functioning of the financial markets. However, the impact of these policy-induced measures is highly dependent on macroeconomic and financial conditions as also on the quality of banks' balance sheets.

During the global financial crisis, and more recently during the COVID-19 pandemic, central banks all over the world initiated a range of policy measures to address macroeconomic concerns. They stabilised operational targets (e.g. money market rate or exchange rate) and provided adequate liquidity to address funding needs of banks, mutual funds, non-bank financial companies (NBFCs) and other intermediaries susceptible to precautionary withdrawals. Central banks also took several measures to address rollover risks, and other market liquidity issues. In addition, they also focussed on improved communications with all stakeholders through credible forward guidance to reinforce confidence, and thereby, guiding their expectations.

At the onset of the pandemic, the Reserve Bank of India (RBI) acted promptly with a slew of policies that included a cut in key policy rates, stabilisation of financial markets by providing adequate funding and ensuring market liquidity, and ample forward-guidance. It has concertedly tried to gauge whether there is a gap between the demand and supply of financial resources and addressed such gaps with appropriate broad-based as well as targeted liquidity measures, while also introducing innovative programmes such as government security acquisition programmes (GSAPs). As a result, the system remained awash with adequate liquidity, and financial conditions eased incrementally with equity markets outperforming all emerging economy peers by August of 2021 (Patra et al., 2021).

Notwithstanding the calibrated policy actions by the RBI, credit growth remained muted in the post-GFC period, although, recent quarters have witnessed a sharp recovery. Credit growth was muted especially in the industrial sector; personal loans and services sector credit growth gained some traction in recent period but still could not reach the highs witnessed in first half of 2000s (Chart 1 a, b). Although credit deceleration was led by public sector banks (PSBs), credit growth of Private Banks (PVBs) was also anaemic as compared to their high growth period prior to 2005–06 (Chart 1c).

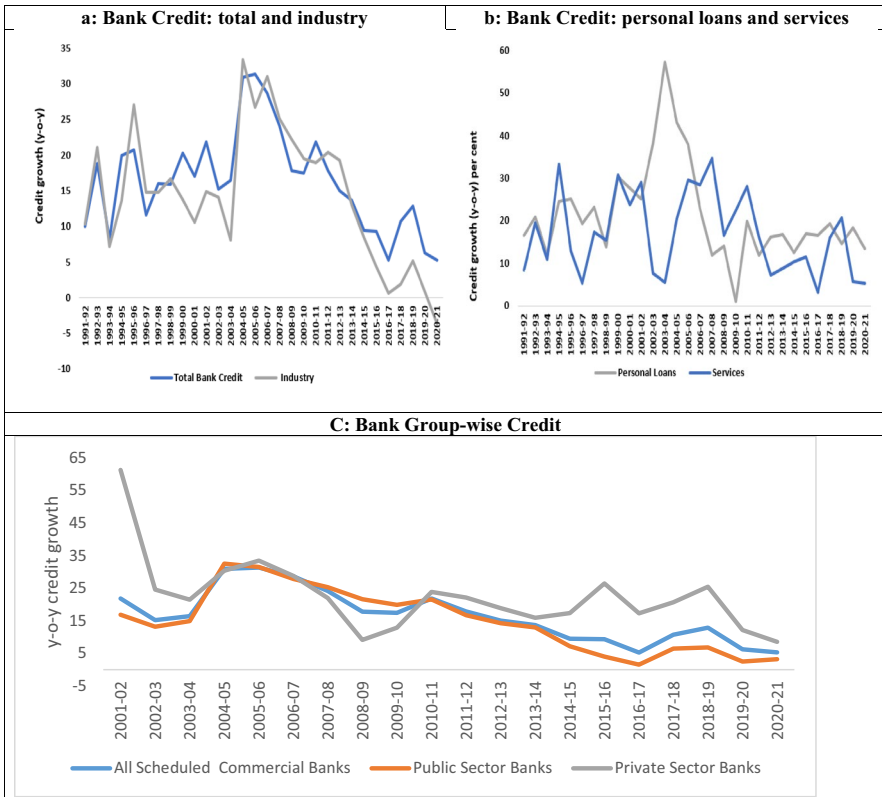


Chart 1 Credit growth in India: sectoral and bank group wise; Source: Basic Statistical Returns, RBI

The present article attempts to evaluate some of the major factors governing the demand and supply sides of India’s credit creation process by identifying factors on both the side (Chart 2), analysing them separately and then disentangling them in a unified econometric framework.

3 Savings and investment needs in India

The Indian savings rate exceeds most advanced economies and all of BRICS nations, other than China (Chart 3).

Till the first half of the 2000s, the savings rate fell short of investment rate (the Gross Fixed Capital Formation to GDP ratio), but the trend reversed subsequently.¹

¹ The GFCF to GDP ratio is taken as the investment rate. It is acknowledged that the positive savings-investment gap does not hold when GCF is used instead of GFCF (barring 2003–04 and the recent COVID-19 years). However, since GFCF is the major and less volatile component of fixed investment, we have chosen that as a proxy in line with academic literature in India (Ghate et al., 2013).

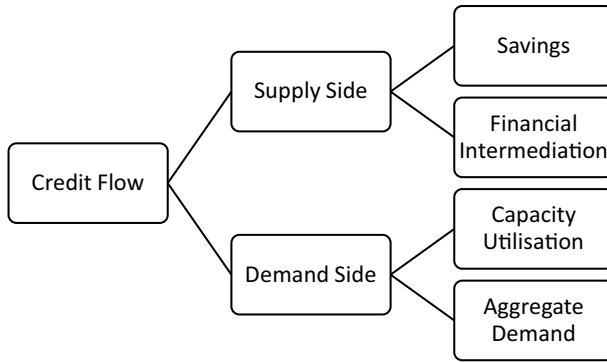


Chart 2 Schematic illustration of credit flow

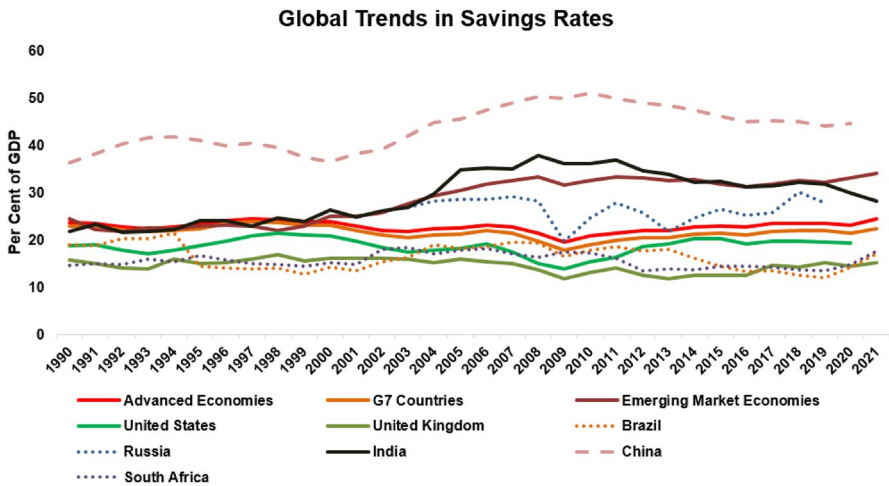


Chart 3 Global trends in savings rate. Source: IMF and World Bank Database

This suggests that although supply of investible funds and the demand for credit, proxied by the investment rate were both falling in the post-GFC period, the rate of decline in credit demand was sharper than that of credit supply (Chart 4).

In the post-GFC period, the gross savings of large non-financial corporates in advanced economies witnessed a rising trend, due to high profitability, partly on account of lower financing costs and tax rates. Importantly, higher internal savings, instead of being used for new capital investment, have been held in the form of liquid financial investment or cash (Mai and Maggi, 2018). In India too, savings of private corporate sector increased since GFC, partly reflecting improved productivity levels, lowering of tax rates and strategic deleveraging of corporate balance sheet (RBI, 2020 and Chart 5).

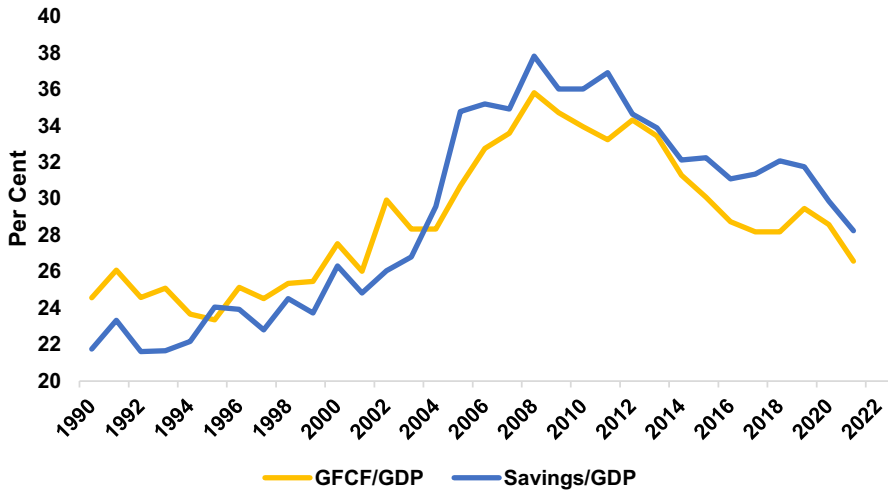


Chart 4 Savings vs. investments. Source: National Accounts Statistics

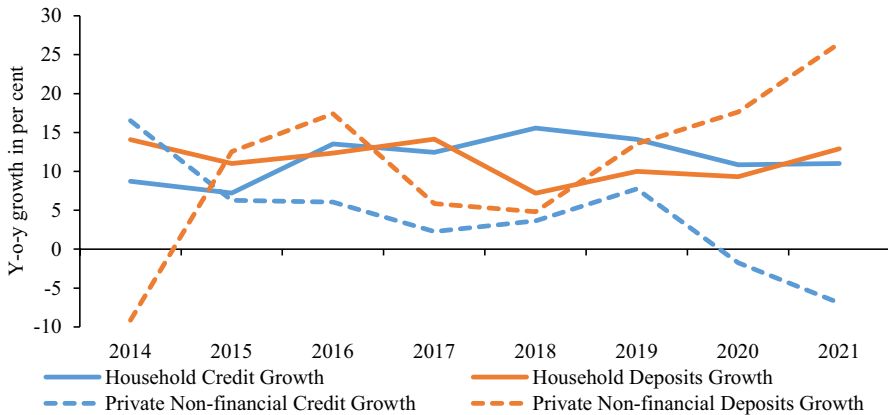


Chart 5 Credit and deposits: household and private corporates (end-March). Source: Report on Trend and Progress of Banking in India 2020–21

4 Financial intermediation

The Indian financial system is largely bank-dominated, and accordingly, bank credit growth is viewed as a key parameter to assess the growth outlook of the economy. Apart from banks, other sources of finance include debt and equity markets and non-bank financial institutions—inclusive of housing finance companies and all India financial institutions (AIFIs) (Annex Table 3). Analysis of historical data suggests that when banking sources of credit weakened, other sources picked up the tab to ensure that financing needs of productive sectors of the economy were met. Since liberalisation, external sources of finance like external

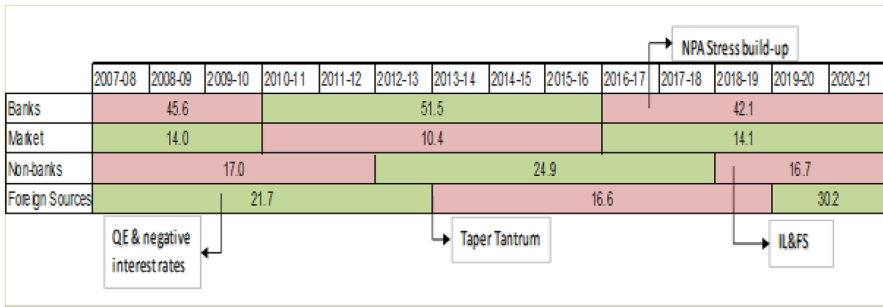


Chart 6 Institutional share in flow of financial resources to commercial sector (share in total in per cent). Notes: (1) QE stands for quantitative easing. IL&FS is the Infrastructure Leasing & Financial Services Limited company. NPA is non-performing asset. (2) Foreign sources of funds are inclusive of ECBs/FCCBs, ADRs/GDR issues excluding banks and financial institutions, short-term credit from abroad and FDI investment. External Commercial Borrowings (ECBs)/Foreign Currency Convertible Bonds (FCCBs), American Depository Receipts (ADRs)/Global Depository Receipt (GDR). Source: Authors' calculations

commercial borrowings (ECB) and foreign direct investment (FDI) have played an increasingly vital role in financing commercial ventures in India. The relative importance of each of these major sources has, however, been influenced by a confluence of macroeconomic factors and has varied significantly since GFC. This period can be loosely divided into three parts viz. 2007–08 to 2009–10; 2010–11 to 2015–16; and 2016–17 onwards, although these parts are not consistent across various sources of finance. Chart 6 depicts the share of each segment in total resources to the commercial sector, over a period. Time periods marked in green are high growth phases, leading to a higher share of that segment in total resources raised, while periods marked in red had subdued growth and lower share.

After a boom during 2003–08, there was a slowdown in real economic activity due to GFC which resulted in a moderation of bank credit growth which muted its share in total financing. The slack in bank credit was partly filled up by market sources, and largely by capital inflows, especially ECBs during 2007–08 to 2012–13. The main reason for these capital inflows were lower interest rates and liberal injection of liquidity in developed economies post-GFC, and investors were in search for higher yields (Herwadkar, 2017).

Bank credit growth is highly procyclical, and evidently, with a growth revival in 2010–11, there was an uptick. Foreign sources of funding remained robust till 2012–13 but retreated subsequently on ‘taper tantrum’. Around this time, credit from non-banking financial institutions (NBFC) picked up steam as the existence of differential regulation provided them with the operational flexibility (Sengupta et al., 2022). This helped them develop sectoral and geographical expertise, extending variety and ease of access to financial services. Therefore, during 2012–13 to 2017–18, credit growth of NBFCs exceeded that of scheduled commercial banks (SCBs). However, NBFCs suffered a setback after the IL&FS crisis that led to drying up of liquidity in the sector and loss of investor confidence

especially in lower rated entities. Post-Covid-19, the targeted liquidity support and refinancing provided by the RBI helped in revival of flows to and from this sector, although the sector is yet to get the traction similar to the pre-IL&FS crisis levels.

Recognising the underlying weakness in bank balance sheets and after several schemes aimed at restructuring and resolution of stressed assets, the Reserve Bank initiated the asset quality review (AQR) in 2015 (Rajan, 2016). This ensured that banks took proactive steps towards cleaning up their balance sheets and recognising true NPAs. This warranted an increase in provisioning and capital requirements, especially in public sector banks (PSBs), causing banks to become more risk-averse (RBI, 2020). Coupled with a period of cyclical downturn, this lowered bank credit growth. Market sources of finance again picked up during this period, as financial innovations and changes in business models contributed to a distinct shift from bank lending to bond issuances by corporates and other non-bank sources (IMF, 2016).

The accommodative monetary policy followed by the developed economies after the outbreak of the pandemic has once again resulted in higher capital inflows to India and the share of foreign sources of funding has risen as compared with the earlier period. Further, substantial easing in financial conditions and persisting surplus liquidity conditions has helped reduce the cost of borrowing across financial segments, which enabled higher private placements—especially debt instruments—by non-financial entities and CP issuances.

The analysis thus suggests that lacunae of bank credit supply was not the binding constraint as the market sources complemented and supplemented them. As such a careful analysis of anaemic demand conditions and reasons for partial shift to other sources are required to understand the investment slowdown better.

5 Demand side: slowdown in output and investment

Major corporate debt pile-up and subsequent defaults followed the over-leveraging during the early 2000s boom and was followed by the twin balance sheet problem. The over-leveraged corporates were reluctant to invest, reducing their new investments to conserve cash flow, while those that remained sound did not invest much either. Private corporate investment, which had been soaring at the height of the boom in mid 2000s, slowed sharply since the GFC (Chart 7). Fixed assets to total assets also showed only a modest increase pointing to subdued capital expenditure. On the other hand, the share of cash and bank balance in total assets increased (Chart 8).

To cushion the impact on the overall economy, public investment has been stepped up considerably in the recent periods, but this has not been sufficient to arrest the fall in overall investment (Chart 9).

Depressed investments in new production capacity have been a key driver of anaemic credit demand. Concurrently, capacity utilisation for manufacturing companies also witnessed a declining trend during this period prompting firms not to make any significant fresh capacity addition (Chart 10). In addition to a slowdown

Chart 7 Real fixed capital formation. Sources: MoSPI and DBIE

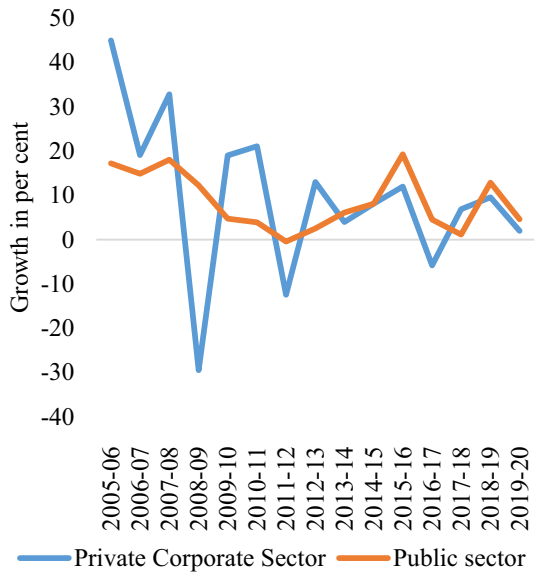
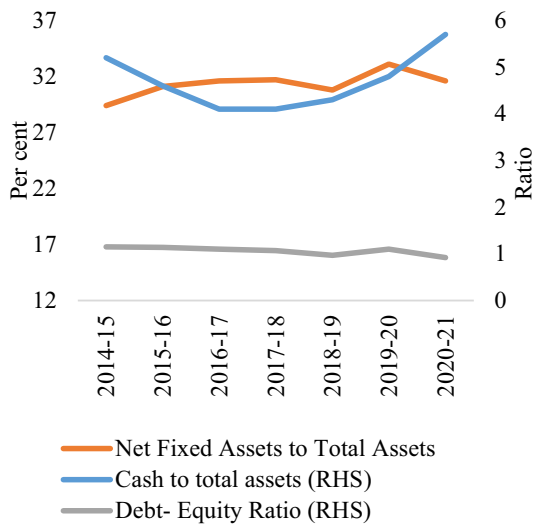


Chart 8 Leverage, fixed assets and cash holdings of domestic private non-financial sector. Sources: CMIE Economic Outlook



in credit demand for investments involving capacity addition, credit demand for working capital also decelerated (Chart 11). This was mainly due to two factors—improving efficiency of supply chains and low wholesale price index (WPI) inflation. The combined effect of supply chain efficiency and low pricing power meant that the working capital needs of companies grew much more slowly than business volumes (Vardhan, 2021).

The investment boom of 2000s was mainly concentrated in infrastructure (such as power, roads, telecom and ports) and construction sector industries. With the

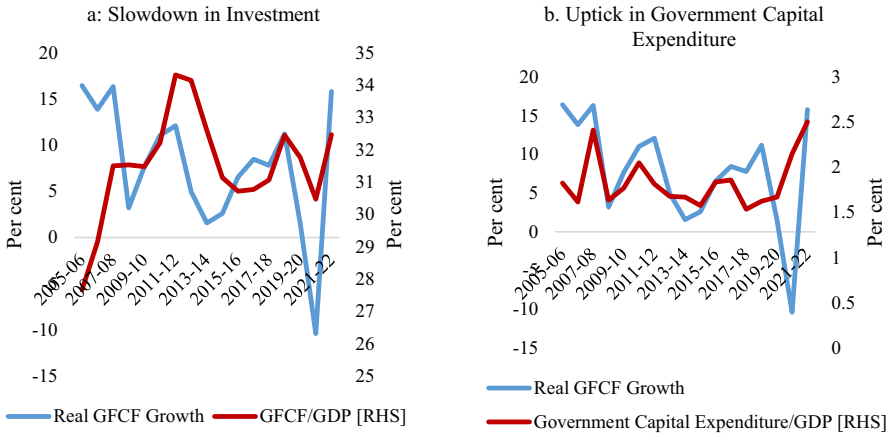


Chart 9 Investment slowdown and government support. Note: Government capital expenditure pertains to central government. Source: National Accounts Statistics

Chart 10 Capacity utilisation of manufacturing sector. Note: using three quarter moving average

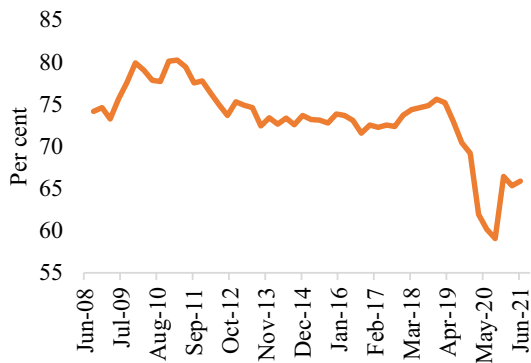
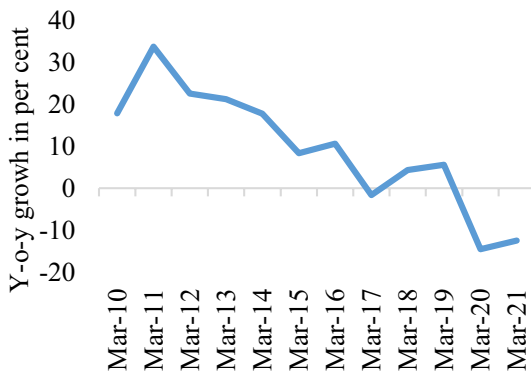


Chart 11 Decline in working capital loans. Note: working capital loans include cash credit, overdraft and packing credit. Source: BSR Returns



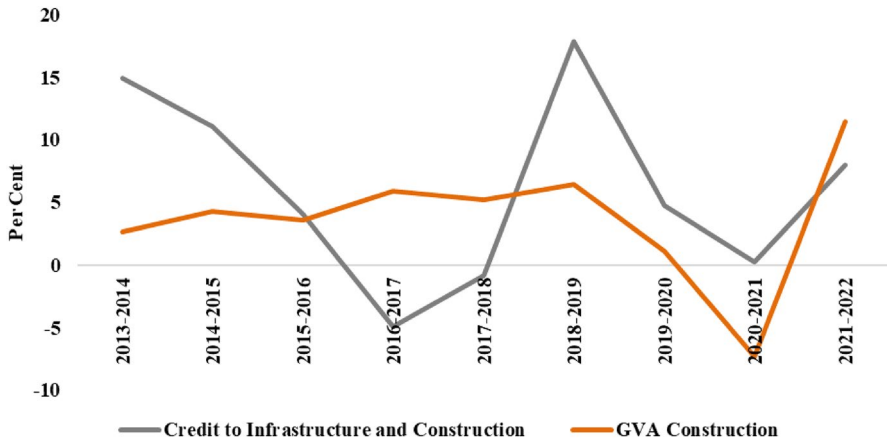


Chart 12 Infrastructure and construction sector. Source: DBIE, CEIC and Authors' Calculations

infrastructure sector being a major recipient of credit, widespread loan defaults resulted in a build-up of poor sentiments, leading to a decline in the overall credit demand (Chart 12).

We now undertake a formal test to establish whether the overall slowdown in credit growth was due to demand side or supply side factors.

6 Empirical analysis: credit demand vs. supply

6.1 Disequilibrium Models: A Brief Literature

To identify the relative role of supply and demand factors of credit, we estimated a disequilibrium model of credit market. From an econometric point of view, the main challenge associated with estimating such disequilibrium models is to obtain estimators for the parameters of loan supply and demand functions using only the observed volume in the credit market. In the presence of asymmetric information, loan rates are not presumed to adjust in each period to clear the market due to stickiness. It leads to a situation where price adjustments take time and in between the market is characterised by either a demand or supply constraint. In this framework, there can be disequilibrium whenever supply does not equal demand at the prevailing interest rate (Chart 13). Apart from price factors such as interest rate, non-price factors also determine supply and demand for credit. As a result, supply and demand for credit do not necessarily clear at each interest rate—allowing the market to be in disequilibrium.

Following Fair and Jaffee (1972) we use an identifying condition that allows shortages, rather than market clearing conditions. The short-side rule assumes that markets are sticky, and postulates that the minimum from these two quantities (i.e. demand and supply) is observed in the data. The directional model mitigates this issue by introducing a separation rule based on price movements (Fair & Jaffee,

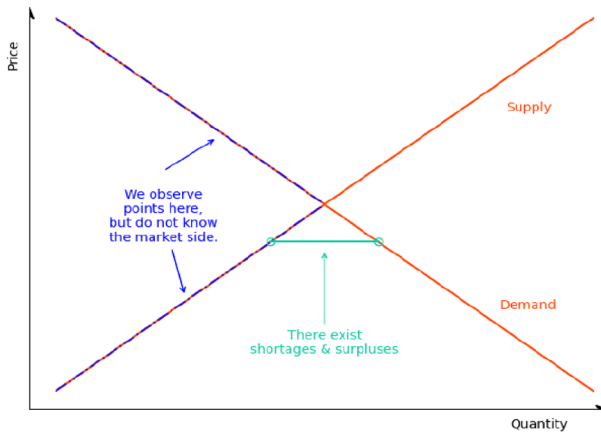


Chart 13 Disequilibrium market specification. Source: Karapanagiotis (2021)

1972), wherein changes in prices are used to separate the sample into excess demand or excess supply. For brevity we do not report the likelihood function, however, it closely follows Maddala and Nelson (1974), and has been discussed extensively in Karapanagiotis (2023).

Notwithstanding these challenges, such models have been used extensively for empirical analysis of credit markets of countries such as Finland, Germany, Poland and Jordan (Bofinger et al, 2017; Hurlin & Kierzenkowski, 2007; Pazarbasioglu, 1997; Poghosyan, 2011). The literature has explored the relative role of demand side and supply side factors in the evolution of credit in these countries in various time periods. In the Indian context, for the period January 2010 to July 2013, Carrasco and Mukhopadhyay (2014) estimated a disequilibrium model of bank credit and found the dominance of demand constraints in the observed credit. We closely follow the disequilibrium approach to shed light on the recent periods, after augmenting these models with asset quality review (AQR), global financial crisis (GFC), global benchmark interest rate changes (Fed Fund Rate), and global supply chain disruption index. We further fine-tuned the demand and supply side variable selections in line with the available literature and using data at monthly frequency.

6.2 Data description

We use total loans and advances to capture the overall quantity of credit, the Benchmark Prime Lending Rate or BPLR, to capture the price of credit, i.e. the interest rate, and several other factors that influence credit demand (e.g. economic activity), supply (e.g. deposits, stress) and global factors (e.g. global rates) from several sources. Table 1 reports summary statistics and sources of all the variables used in our analysis. Since the data is for a relatively long period of time, we used ADF statistics to check for the stationarity properties of these series (reported in Annex Table 4). We difference the variables, where appropriate, to render them stationary and use them for the disequilibrium model estimation.

Our analysis is based on monthly frequency for the period April 2001–March 2020.² We used first difference of logarithm of credit quantity (i.e. credit growth rate) as the dependent variable, which is stationary, and consistent with the credit market disequilibrium literature (Carrasco & Mukhopadhyay, 2014). The independent variables (price variable) for the demand equation estimation include the (log of) State Bank of India's BPLR, which captures the lending rates for loans extended to prime borrowers (Swamy, 2018); the Index of Industrial Production (IIP), growth in Gross Fixed Capital Formation (GFCF), Sensex returns and CPI Inflation to capture economic and investment activity.³

The independent variables chosen for estimation of the supply equation include the log of BPLR and its lags; lagged value of total bank deposits that captures the supply of loanable funds; lagged values of change in total stressed assets ratio (sum of total gross non-performing assets (GNPAs) and restructured standard advances as percentage of gross advances) which capture stress on balance sheet of banks; the capital to risk weighted assets ratio (CRAR), which captures the lending capacity of banks; and finally the asset quality review (AQR) dummy to capture the recognition of bad loans. In an attempt to incorporate the global spillovers of financial conditions to the Indian credit demand, effective US federal funds rate has been taken as a proxy for global interest rate. Further, Global Supply Chain Disruption Index (GSCDI) was considered as a proxy for global supply chain pressures.⁴

6.3 Empirical results

The estimated demand and supply of credit equations are as under:

$$C_{id} = C + \alpha \times T + \sum_{i=1}^4 \beta_i \times \text{BPLR}_{t-i} + \sum_{j=1}^4 \mu_j \times \text{IIP}_{t-j} + \varphi \times \text{Gr.GFCF}_{t-1} \\ + \gamma \times \text{Gr.Sensex} + \delta \times \text{Inflation}_{t-1} + \eta \times \text{Fedfund} \\ + \vartheta \times \text{GSCDI} + \text{Dummies} + U_{id}$$

² For series that are available in quarterly frequency (e.g. GFCF, CRAR), we have repeated the same value of the appropriate data vintage to render them of monthly frequency. Estimating disequilibrium model using the Nelder-Mead optimization method requires a large number of observations. We have also attempted to estimate our model for different sub-sample periods, e.g. pre-global financial crisis (GFC), post-GFC or with post-Covid periods. However, the optimization results from our model estimations reported non-finite values and did not converge. We tried several permutations and combinations of the explanatory variables, both on the demand and supply side, and yet the estimates were not found to be robust. We, therefore, decided to report the results from April 2001 to March 2020, given the large and unanticipated changes in macroeconomic variables during the pandemic period. We however, used suitable dummies to capture the structural shifts for GFC and AQR.

³ GFCF is used as a proxy for investment activity. However, since it is only available at a quarterly frequency, it was converted into a monthly frequency by repeating the same value of the appropriate data vintage to render them monthly.

⁴ <https://www.newyorkfed.org/research/policy/gscpi#/interactive>

Table 1 Data source and descriptive statistics

Data	Unit	Mean	P(50)	Max	Min	Std. dev	Skewness	Kurtosis	Description
CRAR	Ratio	13.4	13.2	16.8	11.4	1.2	1.0	3.7	Capital to risk-weighted assets ratio
CREDIT	Rs. Crore	4,927,984.0	4,288,007.0	13,032,473.0	504,722.4	3,590,256.0	0.4	1.9	Total loans and advances by SCBs
DEPOSIT	Rs. Crore	6,723,761.0	5,742,482.0	17,543,827.0	947,307.2	4,790,916.0	0.5	2.1	Total deposits in SCBs
GDP	Growth	6.6	7.0	21.6	-23.4	4.7	-2.8	21.1	Y-o-Y GDP growth rate (constant prices, spliced to 2011-12 series)
GFCF	Growth	9.3	9.4	61.0	-43.9	10.6	-0.1	14.3	Y-o-Y gross fixed capital formation growth rate (constant prices, spliced to 2011-12 series)
GNPA	Ratio	6.2	5.2	12.4	2.3	3.2	0.4	1.7	(Gross non-performing assets)/(total loans and advances)
GSCDI ^a	Index	120.9	122.6	167.9	87.9	16.4	0.3	2.9	Global Supply Chain Disruption Index
IIP	Growth	5.6	4.7	133.5	-57.3	10.8	5.4	80.5	Y-o-Y Growth of Index of industrial production
INF	Growth	6.2	5.6	13.4	1.5	2.6	0.5	2.3	Y-o-Y CPI combined inflation rate
SENSEX ^b	Growth	1.2	1.0	28.3	-23.9	6.4	-0.3	5.3	M-o-M bse sensx growth
STRESS	Ratio	8.7	9.0	12.9	3.0	3.0	-0.3	1.9	(GNPAs + restructured standard advances)/(total loans and advances)
FEDFUND ^c	Rate	1.4	0.9	5.5	0.1	1.6	1.2	3.4	Effective federal funds rate
BPLR ^d	Rate	12.7	12.7	14.8	10.3	1.5	-0.2	1.8	Benchmark prime lending rate of State Bank of India

Main data source: Database on Indian Economy, RBI; no. of observations = 260

Additional data sources: ^aVarious Sources and Authors' Calculations, ^bBSE, ^cFRED Database, St. Louis, ^dCEIC

$$\begin{aligned}
C_{ts} = & C + \alpha \times T + \sum_{i=1}^4 \beta_i \times \text{BPLR}_{t-i} + \sum_{j=1}^4 \theta_j \times \log[\text{Deposit}_{t-j}] \\
& + \sum_{j=1}^4 \theta_j \times \Delta \text{Stress}_{t-j} + \sum_{j=1}^4 \delta_j \times \text{CRAR}_{t-j} + \sum_{j=1}^4 \varphi_j \times \log[\text{FedFund}_{t-j}] \\
& + \gamma \times \text{Gr.Sensex} + \vartheta \times \text{GSCDI} + \text{Dummies} + U_{ts}.
\end{aligned}$$

Unlike the equilibrium model which assumes $C_{td} = C_{ts}$, the observed credit C_t is assumed to be the minimum of the estimated demand for credit (C_{td}) and estimated supply for credit (C_{ts}), i.e.

$$C_t = \min(C_{td}, C_{ts});$$

For these class of models, identification is essentially done in terms of the estimated variables. The credit quantity is demand driven when credit supply exceeds demand ($C_{ts} > C_{td}$), and the system switches to being supply driven, when ($C_{td} > C_{ts}$). In terms of estimation, this entire exercise converges to finding the probability, $\Pr(u_s - u_d \leq 0; \text{ given } X, \beta)$. Maddala and Nelson (1974) showed that assuming the errors are normal and i.i.d., the model itself allows the determination of probabilities with which each observation belongs to the demand or supply equation. Such disequilibrium models can be estimated using the R 'Markets' Package (Karapanagiotis, 2023).

We use a slew of models to test our hypothesis relating to the credit demand and supply. For choosing the best model in terms of variable selection and lag-structure,⁵ log-likelihood value, and standard errors of the demand and supply equations are considered. The difference between these models is that building on a baseline estimation, which essentially captures domestic factors, we include high frequency financial variable, i.e. Sensex returns, as it may capture market expectations, or possible shift of funds from banks to market sources. In the next two estimations, we expand the model further, to include global interest rate scenarios, and global supply chain disruption index.

Recent literature (Prakash & Kumar, 2021) indicates that credit is strongly influenced by economic activities in India. We have included IIP in our analysis as an economic activity indicator.⁶ Our results indicate that credit demand is positively associated with increase in economic activities (IIP seasonally adjusted lag-1 and lag-2), which is also in line with the findings of Ghosh and Ghosh (1999),

⁵ In India, there is empirical evidence of a lag between the decision to purchase or expand and the actual purchase/expand due to several administrative processes (Ghosh et al, 2019). We therefore start with three lags of each explanatory variable. We then use the maximum Log-likelihood values associated with the model in order to select appropriate lags for the variables as the R 'Markets' package does not report the conventional information criteria for lag selection in disequilibrium model estimation (Karapanagiotis, 2023).

⁶ A strong contender to represent economic activity was GDP. Given the monthly nature of our dataset however, IIP has been chosen as a proxy. Despite its limitations, IIP has been widely used in the literature to date the business cycle and capable of efficiently dating the major turning points in economic activity. (Avyukt, 2018; Saini et al, 2021).

Poghosyan (2011) wherein activity indicators are associated with increased credit demand.⁷

In the transmission literature (e.g. Bhoi et al, 2017; Mitra & Chattopadhyay, 2020) the interest rate channel has been found to operate with a lag. Therefore, we used lagged BPLR for modelling credit. As shown in Table 2, BPLR has a lagged negative effect on the demand for credit after two periods, (Models 1 and 2). A positive coefficient on the first lag of BPLR appears counterintuitive, which may indicate its lagged effect on lending (Ghosh et al, 2021). While financial market rates (e.g. Weighted Average Call Rate, WACR), Mumbai Interbank Offered Rate (MIBOR), etc.) adjust instantaneously, institutional procedures (e.g. paperwork, loan sanctions and disbursements) contribute to these lagged responses (Table 2). These results capture the heterogeneous responses of Indian banks, the lagged transmission of rate hikes, and changes in banks' lending quantum. Inflation, which may indicate the excess aggregate demand conditions, has a positive influence on credit demand and the coefficients were found to be statistically significant across models.

The federal funds rate (FFR) is contemporaneously observed to have a weak positive coefficient on the demand equation (specifications 3 and 4 in Table 2). Being a price taker and an emerging market economy, exports from India to the rest of the world crucially depends on world income. A hike in the FER happens in response to high inflation due to increased aggregate demand in the US. An increase in the global aggregate demand may translate into a need for domestic expansion, and hence the higher demand for loans.

On the other hand, availability of loanable funds, proxied by deposits, was found to be positively associated with credit supply (in models 1 and 2). Stress on balance sheet of banks were found to affect credit supply adversely. This is because the Indian banking sector has had a legacy NPA problem, which has often been a cited as a major constraint on the supply side of Indian bank credit (RBI, 2021). Although the regulatory intervention via AQR was found to be associated with decline in credit supply, its impact was short-lived, captured by the statistical insignificance of the AQR dummy coefficient. Having the benefit of hindsight, recent data suggests that AQR helped in better recognition of asset quality and cleaning the banks' balance sheets, resulting in resilient banks which could withstand a major macroeconomic shock such as Covid-19. CRAR has very low positive or insignificant values. This could be because of (a) for the banking sector as such, CRAR has generally remained above the prescribed levels in India, and (b) for the individual banks, there is empirical evidence that the relationship between CRAR and bank loans in India are non-linear (Verma and Herwadkar, 2019; Muduli & Behera, 2023). Finally, higher global prices of essential commodities and supply chain bottlenecks could result in an adverse aggregate supply shock and cost-push inflation. However, global

⁷ We also tried various dummies such as GFC (April 2008-March 2010=1, otherwise 0) and demonetization (November 2016- March 2017=1, otherwise 0). GFC dummy was found to have a positive coefficient, although the impact on credit demand was negligible. This captures the limited impact of GFC on India, especially on the demand side, and the presence of conducive liquidity and interest rates conditions post-GFC. Demonetization dummy was found to be insignificant on the demand side and the supply side, which is not reported in the main table of results. This could be because demonetization was short-lived.

Table 2 Maximum likelihood estimation of credit market disequilibrium model

Dependent variable: difference of log of seasonally adjusted credit				
Explanatory variables/ dependent variables	Base (1)	With sensex (2)	With fed fund rate (3)	With fed fund and Supply Side Disruption Index (4)
<i>Credit demand</i>				
Constant	-0.08***	-0.07***	-0.28***	-0.26***
Trend	-0.00***	-0.0002***	-0.0003***	-0.0003***
LBPLR_L1	0.22***	0.33***	0.12***	-0.01*
LBPLR_L2	-0.11***	-0.23***	0.16***	0.29***
IIP_SA	-0.00	-0.0002	-0.0005	-0.0004
IIP_SA_L1	0.00*	0.0009*	0.00001	0.0001
IIP_SA_L2	0.00***	0.001***	0.001***	0.001***
GFCF_L1	-0.00*	-0.0008**	0.0001	-0.00009
LInflation_SA	0.05***	0.053***	0.046***	0.04***
GFC	0.01	0.007	0.015***	0.012**
DSensex_SA		0.0002*		
FER			0.01***	
LFER				0.012***
GSCDCI_SA				0.0001
<i>Credit supply</i>				
Constant	0.37***	0.36***	0.10***	0.14***
Trend	-0.00***	-0.0001***	-0.0002***	-0.0001***
LBPLR_L1	0.47***	0.47***	0.44***	0.50***
LBPLR_L2	-0.64***	-0.63***	-0.47***	-0.56***
Δ [LDeposit_SA_yoy]	0.01***	0.01***	-0.08***	0.02***
LSTRESS_SA_L1	-0.06***	-0.05***	-0.03***	-0.02***
CRAR	-0.00*	-0.003	0.004*	0.0001
AQR	0.00	0.0003	-0.005	-0.008*
DSensex_SA		-0.00002		
FER			0.005***	
LFER				0.027
LFER_L1				-0.016
GSCDCI				0.0003
Variance (demand side)	0.00**	0.00005**	0.00004**	0.00005
Variance (supply side)	0.00***	0.0002***	0.0001***	0.0002***

Note: 1. ***, **, and * indicate 1, 5 and 10% levels of significance, respectively, L = $\log()$, and _L1, _L2 represent first and second lags. Some coefficients that were very small but statically significant are reported in the table as 0.00***

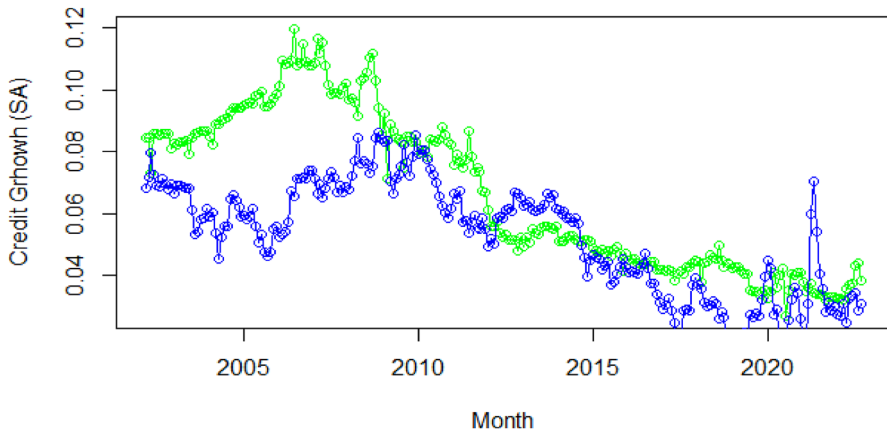


Chart 14 Demand (in blue) and Supply (in green) of credit

supply chain bottleneck index did not have a statistically significant impact on credit in our model.⁸

To sum up, based on the coefficient values, and level of significance, our empirical estimates indicate that bank credit has been more influenced by demand side factors as compared to supply side factors.⁹ This is evident from Chart 14, that the estimated (unobserved) quantity of demand has fallen mostly short of supply from our estimated disequilibrium model for most of the sample period.

Moreover, the disequilibrium algorithm allows us to calculate the *Shortage term* ($D_t - S_t$), which indicates the excess demand (if shortage is positive) or excess supply (if shortage term is negative) of funds is prevailing over the sample period. Our estimated *Shortage* confirms that the bank credit has been demand driven and supply of loanable funds were mostly adequate to cater to the market demand (Chart 15).

In India, the main factors influencing credit supply are the legacy of stressed assets and deposits. The Reserve Bank of India, working in close co-ordination with the Government has taken several steps in recent years to reduce to the burden of historical NPAs as well as developing a conducive environment to moderate fresh slippages. They have borne fruit, as is evident from modest NPAs of the banking sector presently, even after the major macroeconomic shock of Covid-19. As such, the recent credit offtakes rather appear to be demand driven and supply of funds have not been an effective constraint. The increase in credit growth in the recent months with the revival of the economy supports our finding. Therefore, aimed at sustained economic revival, appropriate vigil on prices and asset quality of banks could sustain the credit flows for the endogenous and sustained recovery.

⁸ Alternatively, we also use the Global Supply Chain Disruption Index, which is derived using the dynamic factor extracted from Baltic Dry Index, Bloomberg Commodity Index, IMF Fuel Energy Index and semiconductor equipment billing (Bhadury et al. 2021). However, the variable remained insignificant.

⁹ Demand side variance were found to be less than supply side variances.



Chart 15 Shortage (demand–supply)

7 Conclusions and way forward

In this article, factors affecting both supply and demand are examined to decipher what caused credit slowdowns, taking cue from post-GFC data for India, a major EME. Evidence presented in the paper suggests that credit growth initially slowed because of demand side factors. This resulted in a self-reinforcing downward cycle leading to further growth slowdown. Recent episodes such as the pandemic, excess capacity created in the first half of 2000s, and subsequent unfavourable global trade environment could be the possible reasons for a slowdown in investment demand.

While bank credit has revived subsequently with the gradual easing of global supply side bottlenecks, revival of domestic economic activities, and firming of consumption spending, potential future downside risks may continue to emerge from poor recovery in domestic demand and a possible drag in global demand for services, as these may hamper the need for credit to expand economic activity.

Going forward, the economies must also leverage low-cost resource allocation and distributive efficiency while protecting stakeholders' trust from digital frauds and ensuring data privacy. A more developed financial system, greater financial inclusion, reduced vulnerability to shocks, and increased incomes by enhancing investment and productivity growth are likely to provide tailwinds to sustained credit growth.

8 Annex

See Tables 3 and 4.

Table 3 Flow of financial resources to commercial sector

	2017–18	2018–19	2019–20	2020–21
A. Adjusted non-food bank credit (NFC)				
(i) Non-food credit	9,16,109 (42.8)	12,29,977 (52.3)	5,81,209 (40.7)	5,71,425 (35.6)
of which: petroleum and fertiliser credit	7,95,897	11,46,677	5,88,985	5,71,210
(ii) Non-SLR investment by SCBs	2724	7463	21,721	-20,365
	1,20,212	83,301	-7775	215
B. Flow from non-banks (B1 + B2)				
B1. Domestic sources				
1 Public and rights issues by non-financial entities	12,24,042 (57.2)	11,22,424 (47.7)	8,47,837 (59.3)	10,32,920 (64.4)
2 Gross private placements by non-financial entities	8,85,589 (41.4)	7,35,678 (31.3)	3,04,742 (21.3)	6,55,122 (40.8)
	43,826	10,565	63,689	37,950
	1,46,176	1,55,133	2,37,062	2,78,882
3 Net issuance of CPs subscribed to by non-banks	-25,377	1,36,089	-1,52,722	41,789
4 Net credit by housing finance companies	2,19,840	1,65,893	28,482	46,945
5 Total accommodation by four RBI-regulated AIFIs—NABARD, NHB, SIDBI and EXIM Bank	95,084	1,11,984	82,160	1,35,015
6 Systemically important non-deposit-taking NBFCs and deposit taking NBFCs (net of bank credit)	3,68,243	1,26,004	-22,696	79,204
7 LJC's net investment in corporate debt, infrastructure and social sector	37,797	30,011	68,766	35,337
B2. Foreign sources				
1 External commercial borrowings/FCCB	3,38,454 (15.8)	3,86,746 (16.4)	5,43,096 (38.0)	3,77,799 (23.5)
2 ADR/GDR issues excluding banks and financial institutions	-5,129	69,629	1,54,263	874
	0	0	0	0
3 Short-term credit from abroad	89,606	15,184	-7704	-30,411
4 Foreign Direct Investment to India	2,53,977	3,01,932	3,96,536	4,07,335
C. Total flow of resources (A + B)	21,40,151 (100.0)	23,52,401 (100.0)	14,29,047 (100.0)	16,04,345 (100.0)

Source: Handbook of Statistics on Indian Economy

Table 4 Augmented Dicky–Fuller (ADF) test statistics

Null hypothesis	<i>t</i> -statistic	Prob.*
BPLR has a unit root	− 1.35	0.61
CRAR has a unit root	− 1.48	0.54
CREDIT has a unit root	2.06	1.00
DEPOSIT has a unit root	9.06	1.00
FEDFUND has a unit root	− 2.60	0.09
IIP has a unit root	− 9.18	0.00
INF has a unit root	− 1.50	0.53
SENSEX has a unit root	− 15.03	0.00
STRESS has a unit root	− 2.62	0.09

*MacKinnon (1996) one-sided *p* values

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