

Chapter 3

CROSS-BORDER BANKING IN INDIAN CONTEXT

By

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1. Introduction

From a relatively isolated economy in a global context with somewhat muted economic performance to finding itself placed among the fastest growing countries in terms of output and aspiring to become an economic powerhouse, the Indian economy has made a remarkable transition in the past three decades. The liberalization wave which surged in 1991 paved way for globalization of the Indian economy and the reforms undertaken in the early nineties and beyond led to the integration of India with global markets in terms of trade, finance, knowledge flow, labour among others. The banking sector was also reformed drastically during this period as will be detailed later in the paper. As the Indian economy continues to become integrated with the international financial system, its exposure to cross-border risks is certainly increasing. The crisis of recent times including the Great Recession of 2008 has brought to the fore the risks that arise in the backdrop of the global integration of financial markets (Prasad, 2010). In this scenario, it has become ever important that vigilant and pro-active monitoring of risks is to be done on a continuous basis. The banks play a very crucial role in the Indian economy. It is important to note that the Indian financial system is largely bank dominated (RBI, 2017b). Further, the banking sector is the biggest absorber of household financial savings in the country as well as the largest contributor to the household sector's financial liabilities (Prakash et al., 2018). The banking sector has a crucial role in the financial system network in India too, as it accounted for around 46% of the bilateral exposures as of March 2018, more than any other financial entities and almost three times of the next biggest contributor (RBI, 2018b). Hence, the Indian banking sector is one of the most important pillars of its economy and any risk materializing from this sector can have widespread ramifications on the economy's multiple actors and sectors alike. The regulation and supervision of the banking sector in India is vested with its central bank, i.e., the Reserve Bank of India under the Reserve Bank of India Act, 1934 and the Banking Regulation Act, 1949. This paper is an attempt to analyse the integration of the banking sector in India with the countries across its border. The international operations of the banking sector in India are regulated by the Reserve Bank under the Foreign Exchange Management Act (FEMA) Act. As we shall discuss in detail later, owing to regulations, cross-border banking in India is comparatively small in size.

Cross-border banking is expected to bring about positive effects for the lending as well as borrowing countries through newer investment opportunities, higher returns on assets, risk diversification and increased efficiency owing to higher competition among others. However, these benefits are not free of costs. The more integrated banking channels become, the probability of

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risks spilling over from one country to another increases. The recent great financial crisis of 2007-08 and its aftermath was the realization of such risks at a massive scale which put the entire global economy into jeopardy. The objective of this paper is to understand cross-border banking in the Indian context. Owing to India's calibrated and partial opening of its capital account, the banking sector's cross-border activities are subject to prudential regulations. We will try to understand the international exposure in the context of Indian banks by analysing the data on the same. Specifically, we will study the breakdown of international assets and liabilities of India, the geographical origin of the same, the currency-wise break down among others such features of international banking. We will also apply the technique of network analysis to understand the India's position *vis-à-vis* its major banking partner countries. This will be done for both liabilities as well as claims.

In the present analysis, an attempt has been made to study the cross-border risks to the Indian banking sector. Using secondary data consolidated by the Bank of International Settlement (BIS) and the Reserve Bank, the robustness of the banking sector in context of its international banking operation will be assessed. The succeeding section discusses the evolution of the banking sector in India, the current scenario, along with a discussion on the recent developments and challenges facing the sector. Section 3 briefly reviews the available literature on the issue. This is followed by the discussion of the data and methodology in Section 4. Cross-border banking in the Indian context along with the presentation of some stylised facts and the experience of the Indian banking sector in recent crises is discussed in Section 5. Section 6 discusses the results of the network analysis of a sample of countries, with India being the focus. The paper is concluded in Section 7.

2. Banking Sector in India: A Brief Overview

As mentioned earlier, the Indian financial landscape is mostly dominated by the banks (RBI, 2017b). The number of domestic banks in India stands at 117 (21 public sector (universal) banks, 21 private sectors (universal) banks, 3 local area bank, 10 small finance banks, 6 payment banks, 56 regional rural banks)². In addition, there are 45 foreign sector banks (FSBs) in India³. However, the majority of the banking activity remains dominated by public and private sector universal banks (thereafter PSBs and PvSBs). Before discussing the salient features of the Indian banking system, a very brief historical account of Indian banking follows.

2.1 Brief History of Banking Sector

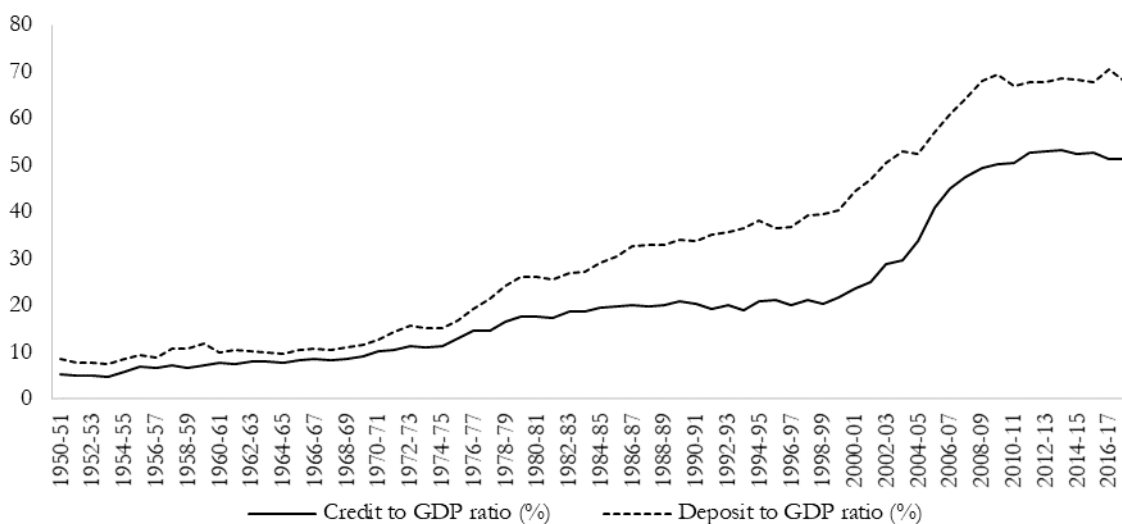
The banking sector in India has undergone a plethora of changes since independence. Borrowing from RBI, 2008 which presents detailed information on the evolution of the sector in India, it may be mentioned that after independence of the country in 1947, the banking sector saw two major transformations *viz.* nationalisation in late 1960s (followed by another such exercise in 1980) and liberalisation ushering in the era of reforms in 1991 and beyond. The two decades of the banking sector were completely dominated by the private sector which saw a major overhaul in form of nationalisation in the late 1960s and beyond, which led to almost absolute government control over the sector till 1990. One of main premises of the nationalisation was the extension of

2. The information accessed from <https://rbi.org.in/commonman/english/scripts/banksinindia.aspx#SBI> as of September 21, 2018 at 2000 IST.

3. Apart from these, there are number of credit co-operatives, comprising of urban co-operative banks (UCBs) and rural co-operative credit institutions operating in the country. However, their share is small in India's financial system (RBI, 2017b).

banking services to sectors like agriculture, small industry and exports which may be ignored by the banks working purely with profit motives (Banerjee et al., 2004). The liberalisation of Indian economy in 1991 had profound impact on the banking sector as well. The reforms of the 1990s later brought in sweeping changes including changes in the ownership structure of public sector banks with the government being the major owner in these banks rather than the only owner as in the past, opening up the sector for private players, operational freedom, phased deregulation of administered interest rates, removal of automatic monetisation of fiscal debt, significant reduction of financial repression *inter alia* through phased reduction in cash reserve ratio and statutory liquidity ratio and many others (Acharya, 2000; Shirai, 2000; RBI, 2008; Mohan and Ray, 2017). The other major reforms in the money market, payment systems and external sector also contributed to modernizing of the banking sector (Mohan and Ray, 2017). Against the backdrop of this evolution, the banking sector in India grew tremendously and the same is indicated in the increase of credit and deposit as ratios of GDP in the country (Chart 1).

Chart 1
Credit and Deposit as Ratio of GDP in India (in %)

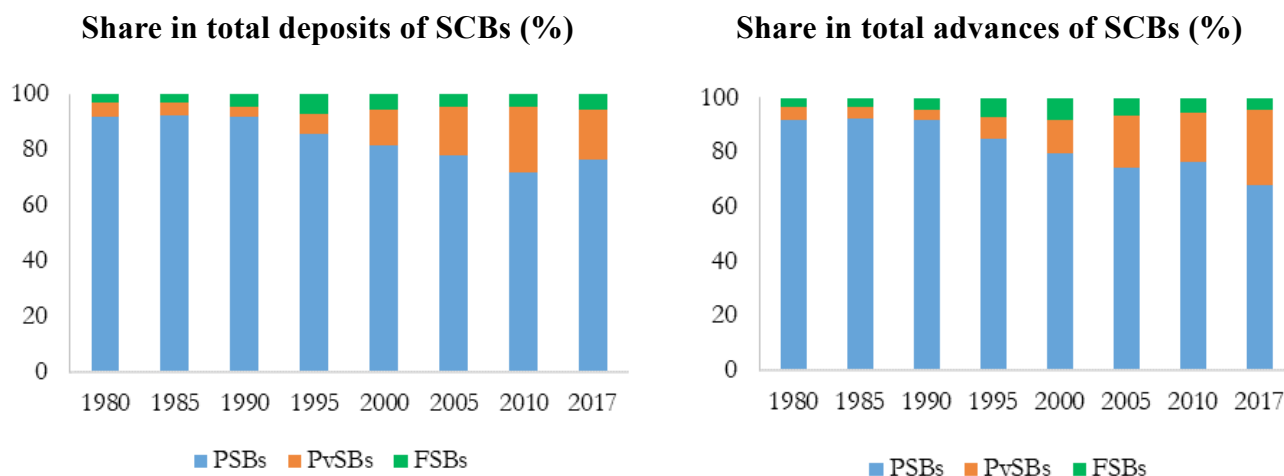


Source: Author's calculation based on Database on Indian Economy, Reserve Bank of India.

2.2 Present Scenario of the Banking Sector

With this brief historical background, we now reorient our discussion towards the present landscape of the sector. As discussed earlier, the banking sector in India plays an instrumental role, being the one major contributor to flows to the commercial sector as well as being the biggest absorber of household saving in the country (RBI, 2017b; Prakash et al., 2018). However, in spite of opening up of the sector for private players in liberalisation reforms, the Indian banking sector continues to be dominated by 21 PSBs in which the Indian government holds the majority stake, although the share of private sector banks has shown gradual improvement (Chart 2). The public sector banks account for the majority of deposits and advances showing their overall significance in the economy. The role of the FSBs is very limited compared to their public and private sector counterparts. The capital to risk weighted ratio for the scheduled commercial banks stood at 13.8% as of March 2018 (RBI, 2018b). The net interest margin for the sector was 2.7% as of March 2018 (RBI, 2018b).

Chart 2
Public and Private Sector Banks' in India – A Comparison



Source: Ramasastrri and Samuel (2006); Author's calculation based on Statistical Tables Relating to Banks in India (accessed from Database on Indian Economy, RBI's Data Warehouse).

2.3 Domestic Systemically Important Banks (D-SIBs) in India

The unfolding of the global financial crisis in the previous decade was an evidence of the risk posed by large and inter-connected financial institutions, spilling over and spreading to entities within and outside national borders, negatively impacting the growth in many countries as well as global economic expansion. In the aftermath of the crisis, the Basel Committee on Banking Supervision (BCBS) developed a framework 2011 for identifying the Global Systemically Important Banks (G-SIBs). It also advocated additional loss absorbency capital requirements applicable to these G-SIBs. Further, other member countries were required to put in place a regulatory framework to deal with Domestic Systemically Important Banks (D-SIBs)⁴. Consequently, the Reserve Bank developed a framework to identify the DSIBs and also prescribed additional capital requirements for these banks. Further, an additional common equity requirement is applied based on the bucket in which a D-SIB is placed⁵. Based largely on the framework of BCBS to identify G-SIBs, the indicator-based approach and methodology is being used in India for DSIBs' identification. The indicators used to assess domestic systemic importance of the banks are their size; their interconnectedness; their lack of readily available substitutes or financial institution infrastructure; and their complexity (RBI, 2014). The banks having a size of more than 2% of GDP are considered for this exercise. Currently three banks, *viz.* the State Bank of India (a PSB and the largest bank in India), the ICICI and the HDFC (both PvSBs) have been identified as DSIBs in India⁶.

4. Source: https://www.rbi.org.in/scripts/bs_viewcontent.aspx?Id=2861

5. In case a foreign bank having branch presence in India is a G-SIB, it has to maintain additional capital surcharge in India as applicable to it as a G-SIB, proportionate to its Risk Weighted Assets (RWAs) in India. (https://rbi.org.in/Scripts/BS_PressReleaseDisplay.aspx?prid=41556).

6. Source: https://rbi.org.in/Scripts/BS_PressReleaseDisplay.aspx?prid=41556 accessed on September 23, 2018.

2.4 Recent Developments and Challenges of the Indian Banking Sector

2.4.1 Introduction of Differentiated Banks

The Indian banks were, till very recently, universal in their activities. However, the sector has now been opened for differentiated banks which serve niche clients/segments and the beginning was made in this direction by issuing the licences to the small finance banks⁷ and the payment banks⁸ which commenced their operations during last two years. The idea is being mooted to set up wholesale and long-term finance (WLTF) banks which will be entrusted with task of meeting the credit needs of the infrastructure sector and small, medium and corporate businesses. It is envisaged that differentiated banks will contribute to the economic development by furthering the cause of financial inclusion and catering to varied credit needs in the country (RBI, 2017b).

2.4.2 Asset Quality Concerns

In the most recent times, the banking sector in India is facing challenges of asset quality concerns and banks' weak balance sheets (RBI, 2015, 2016, 2017a, 2017b; GoI, 2018). The ratio of gross non-performing assets as a percentage of gross advances has increased in recent years with the ratio of gross non-performing assets (NPAs) being much higher in PSBs as compared to PvSBs. Further, the concentration of NPAs remains proportionally higher in industrial sector *vis-à-vis* agriculture and service sectors (Chart 3a and 3b). The current NPA issue has been attributed to excessive credit growth in the preceding period, long-term infrastructure financing by the banks leading to asset-liabilities mismatch, unfavourable economic conditions, structural issues negatively impacting the funded projects among others (Sengupta and Harsh Vardhan, 2017; Samantaraya, 2016). The capital to risk weighted assets ratio for PSBs was 11.7%, whereas for PvSBs it was registered at 16.4% as of March 2018 (RBI, 2018b). The Insolvency and Bankruptcy code, as will be discussed later, is one of the most important steps taken by policy makers to not only tackle the present episode but also ensure that the resolution process becomes efficient to minimise the risk of such incidences occurring in the future.

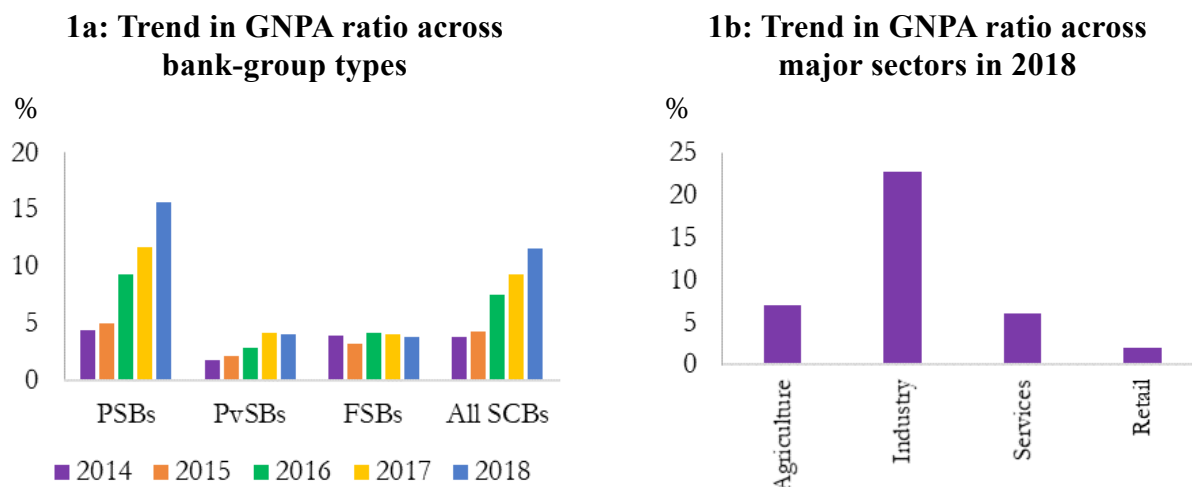
2.4.3 Insolvency and Bankruptcy Code

The problem of worsening asset quality in India was compounded by the multiplicity of legal acts and processes, and their complexity as well as their improper utilisation by the banks which made the recovery and resolution process difficult in case of bad loans (RBI, 2017b). A landmark development was the introduction of the Insolvency and Bankruptcy Code in 2016, which has now become a single law for insolvency and bankruptcy in a time-bound manner and envisages the speedy resolution of bad assets, bringing much needed efficiency in the process.

7. The objectives of these banks are to provide savings vehicles and supply credit to small business units; small and marginal farmers; micro and small industries; and other unorganised sector entities, through high technology-low cost operations (https://www.rbi.org.in/Scripts/BS_PressReleaseDisplay.aspx?prid=32614).

8. These banks have been set with an aim of providing small savings accounts and payments/remittance services to migrant labour workforce, low income households, small businesses, other unorganised sector entities and other users (https://rbi.org.in/scripts/BS_PressReleaseDisplay.aspx?prid=32615).

Chart 3
Rising NPAs in India – Bank-group and Sectoral Trends



GNPA: Gross non-performing assets; SCBs: Scheduled commercial banks;

Notes:

1. GNPA ratio refer to the GNPA as Percentage of Gross Advances.
2. SCBs here refer to PSBs, PvSBs and FSBs taken together.

Source: Handbook on Indian Economy, 2018, RBI and Financial Stability Report, June 2018, RBI and the RBI.

2.4.4 Recapitalization and Consolidation of Public Sector Banks

Recapitalization of PSBs is one of the important step in solving the ongoing problem of asset quality in view of their weak balance sheets and impact on fresh credit creation. The majority ownership of the government in these banks, however, limit their access to market resources for raising capital (Sengupta R. and Harsh Vardhan, 2017). At the same time, recapitalisation by the government imposes huge costs on the public exchequer. Keeping these trade-offs in mind, the Indian Government recently introduced a recapitalization package named the *Indradhanush* programme.

Further, the consolidation in the banking sector of public sector banks has long been an issue in the policy discourse with the various committees formed by the policy makers arguing for the same (Narasimham Committee Report, 1991 and 1998). The same was reiterated in the budget speech 2016-17 of the Finance Minister⁹. The Government of India has since embarked on the route of consolidation of the public sector banks. As the first step, the merging of the State Bank of India (the largest bank in India) and its associates was undertaken. There is a proposal to merge three more PSBs together to form the second largest bank in the near future.

2.4.5 Efforts to Step-up Financial Inclusion

The Indian banks, serving an emerging nation, are also entrusted with a multitude of developmental activities. Financial inclusion is one such goal which has been pursued continuously over the years to bring hitherto unbanked population under the ambit of the formal banking sector. The banks play an instrumental role towards the goal with both the Reserve Bank and the

9. Accessed from <https://www.indiabudget.gov.in/budget2016-2017/ub2016-17/bs/bs.pdf>

government making overarching guiding policies and initiatives in the direction. Consequently, a number of initiatives has been taken in recent years, including the opening of specialized banks in form of the small finance banks and payment banks, liberalisation of the branch opening norms¹⁰, the massive account opening scheme in the form of *Pradhan Mantri Jan Dhan Yojna*¹¹, the *Pradhan Mantri Mudra Yojana* scheme with the major aim of providing small loans to small and micro units/entrepreneurs, employment of technology to encourage digital modes of payment by lowering cost, improving their ease of use, increase adoptability among many others. Further, the existing schemes like the priority sector lending¹², Kisan Credit Card¹³ scheme, financial literacy drives, business correspondent model to encourage banking at the doorsteps in the rural areas of the country, the lead bank scheme¹⁴ among others are fine-tuned on a continuous basis to improve their efficiency in furthering the cause of financial inclusion.

Notwithstanding the challenges facing the sector, the ever changing and evolving banking landscape in India continues to give impetus to India's growth story. With this brief background of the Indian banking sector, we know that presently, the literature review focuses on the increasing integration of financial systems across the countries, their repercussions including the studies which have analysed these international networks and the possible contagion that this integration brings along.

3. Literature Review

The increasing connectedness among the financial systems of different countries with each other is one of the most prominent features of globalization. The opening of capital accounts in developing economies contributed to this rising integration (Agenor, 2013). As discussed in Agenor (2013), this international financial integration can benefit countries through multiple potential channels *viz.* smoothing of consumption through international risk sharing, improvement in domestic investment and growth, increased discipline at macroeconomic level and increased efficiency and stability of the domestic financial system. However, this integration does not come

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10. The Reserve Bank rationalised branch opening in May, 2017 (refer to <https://rbi.org.in/Scripts/NotificationUser.aspx?Id=10972&Mode=0> for details) with an objective of defining 'banking outlet' and harmonising the treatment of different forms of bank presence for the purpose of opening outlets in underserved areas.
 11. The Pradhan Mantri Jan Dhan Yojana is the massive, flagship initiative of the Government of India to extend financial services to the masses. It was launched on August 28, 2014 (RBI, 2015). So far, 327.5 accounts have been opened under the scheme (as of September 19, 2018) (accessed from <https://pmjdy.gov.in/account> on September, 2018).
 12. The objective of priority sector lending (PSL) is developmental in nature which is aimed to provide vulnerable sections of the society access to credit and ensure flow to sectors with high employment potential (RBI, 2015a). The priority sector includes agriculture, micro, small and medium enterprises, export credit, education, housing, social infrastructure, renewable energy and others (<https://m.rbi.org.in/Scripts/FAQView.aspx?Id=87>). As per current norms, 40% of Adjusted Net Bank Credit or Credit Equivalent Amount of Off-Balance Sheet Exposure, whichever is higher needs to be allocated for priority sector by domestic SCBs and FBs with 20 more or branches (<https://m.rbi.org.in/Scripts/FAQView.aspx?Id=87>).
 13. Kisan Credit Card Scheme is an innovation which has an objective of providing adequate and timely credit support from the banking system under a single window to the farmers for their cultivation & other needs (<https://rbidocs.rbi.org.in/rdocs/content/pdfs/CRB5100512AN.pdf>).
 14. Refer <https://www.rbi.org.in/Scripts/NotificationUser.aspx?Id=11321&Mode=0> for details. The scheme's objective is to coordinate activities of banks and other developmental agencies to increase priority sector lending and promote the role of banks in rural sector development.

without the costs. With the increased globalization and integration of financial channels across the countries, the risk of contagion spreading from shock in one country to other connected countries has only been rising. In fact, it has been argued that these networks can contribute to the amplification of financial booms and busts, which in turn causes crises (Borio and Disyatat, 2011; Borio, 2014) making them not only a factor for the spread of the crisis but also the reason for crisis in the first place. Borio et al. (2015) found that the international monetary and financial system raise the risk of financial crises which have significant macroeconomic costs. In fact, Dungey and Gajurel (2015) argued that the crises which are transmitted across the borders are difficult to be tackled by domestic policy makers. Cerutti et al. 2014, also discussed that global financial linkages and channels of spread of spillovers are more complex. Tonzer (2015) also argued that international banking which can have positive effects during the periods of stability are to be treated cautiously during the periods of turmoil as they may affect the entire network. The great recession of 2007-08 and its aftermath has once again brought these issues to the fore. There is also evidence that those emerging economies which had direct or indirect exposure to banks in crisis-affected countries, also experienced higher capital outflows during the crisis of 2007 (Park and Shin, 2017). This shows that banking integration can also have impact on other sectors of financial systems as well.

The increasing interconnectedness of financial systems and the associated risks has been of the interest to researchers. Alan and Gale (2000) in their seminal work modelled contagion to understand how a small shock in one region of an economy can translate into economy wide crisis and found that a complete network of banks with every bank connected to another are more resilient to risks rather than an incomplete network. Upper (2011) based on his review of the existing research on contagion, found that there are many possible channels of contagion through the liability side (bank runs, common liquidity pool, asset quality concerns, portfolio rebalancing, fear of direct effects, protentional lenders' behaviour) and asset liability side (interbank lending, payment system, security and forex settlement, direct exposure, equity holdings, asset prices). There have been studies which have tried to identify the relative importance of these channels in the crises of the recent past. OECD (2012) also highlighted the role of cross-border banking contagion in the great financial crisis of later 2000s and mentioned that bank balance-sheet contagion can be of a direct nature through "lending-country spillovers" and indirect banking contagion through "common-creditor contagion". It further discussed that crisis risk have been bigger for common-creditor contagion. Forbes (2012) discussed that shock arising in one country in form of increased stressed assets and lowering of bank deposits can spread to other countries because of the reduction in bank credit in other countries to restore capital adequacy.

Methodologically, a number of techniques have been used to study the status of network and contagion risks among banking sectors across the borders. The network analysis based on the graph theory has been applied in number of studies to study the banking network existing among a large number of countries across continents (Minoiu and Reyes, 2013; see Huser, 2015 for detailed review). Minoiu and Reyes, 2013 using data from 1978 to 2010 found that the density of international banking network is pro-cyclical and country connectedness rose before crises and then rapidly falling after the occurrences. Further, they found that the recession of 2007 was comparable to earlier periods in terms of increase in aggregate flows, suggesting the location of origin of shock in the network's core was responsible for the crisis' severity. There are also studies which used simulation exercises on the matrix of bilateral credit relationships among domestic and foreign banks for specific countries on bank level data (Degryse et al., 2009; Degryse and Nguyen, 2009; Upar and Worms, 2004; Gabrieli et al., 2015 and see Upper, 2011 for review). Gropss et al. (2009) relied on econometrics exercises in the form of a multinomial logit model to find that there existed significant cross-border contagion in a sample of European banks from 1994 to 2003.

They also mentioned that contagion may have heightened with the Euro's introduction. Gabrieli et al. 2015 found that contagion is most closely associated with the bank's position in the network and exposure to counterparties which are the riskiest in nature. Degryse et al. 2009 also found that for the period 1999-2006, the shock impacting liabilities of one country has the potential to affect the complete financial system and contagion was more prevalent in countries sharing close geographical distance.

There are number of studies which included India in their cross-border banking network and contagion analysis. Dungey and Gajurel (2015) in their study of banking contagion in 54 countries during 2007-09 employing the Capital Asset Pricing Style Framework found that India exhibited all three channels of contagion *via* systematic, idiosyncratic and volatility. However, only idiosyncratic increased the likelihood of systemic crisis in the country. Minoiu and Reyes (2013) used the network analysis on confidential location-based flow data provided the BIS and defined global banking network with a core-periphery structure. They found that in the run-up to crisis of 2008, the BRIC (Brazil, Russia, India, and China) were among the most integrated borrowers alongside countries of emerging Europe. The Reserve Bank of India also conducts network analysis and contagion analysis in its half yearly Financial Stability Reports at the national level to identify the dominant banks in the sector as well as the dominant sectors in the overall financial system. RBI (2018b) found the number of dominant banks on basis of their network analysis to be 4. Further in the network analysis of the Indian financial system, the banking sector was identified to be the most significant compared to other financial entities in terms of bilateral flows.

4. Data and Methodology

As far as data is concerned, the current paper relies on the Locational Banking Statistics (LBS) and Consolidated Banking Statistics provided by the Bank of International Settlement (BIS). Additionally, the data on International Banking Statistics as compiled by the Reserve Bank of India has also been used for the analysis to supplement the data provided by BIS. The methodology can be broadly divided into two parts. In first part, we discuss the main components of international assets and liabilities of Indian banks in the backdrop of the regulations under which they operate. This section will also include the other stylised facts related to counter-countries, currency denomination and also comparison of India with its peers in terms of their participation in cross-border banking operations. This will then be followed by the application of the network analysis to understand India's position *vis-à-vis* other countries with which the country shares cross-border banking relationships in terms of liabilities as well as assets.

The network analysis has emerged as an important tool to understand networks in recent times with applications in varied fields. The tool is also important in the economics and financial analysis to gain insights into networks operating in these sectors. As explained in the preceding section, there is a strand of the literature which has employed this tool to understand cross-border banking transactions. We will also apply this methodology to understand international banking in the Indian context. The network analysis is based on the graph theory, the branch of mathematics devoted to study pairwise associations between objects. The network in our analysis, in non-mathematical terms, consists of a set of vertices (also known as nodes, points) which represent the countries and edges (also known as line, arcs) showing the claims or liabilities between the country pairs. Since the focus of this paper is on India, the countries in our analysis are restricted to those with which India is involved in terms of cross-border banking transactions. Specifically, we have combined the information from BIS's Locational Banking Statistics and the Reserve Bank's International Banking Statistics to draw our sample. The Reserve Bank's database include information on the

top 14 and 13 countries with which India has the topmost liabilities and claims, respectively. For these countries, the data was then drawn from BIS's LBS database to find these countries' major banking counter-countries and the data wherever available, was included in our analysis to form the network and gain insights into the position of India. Apart from data on these major countries, we also included the countries and their major counter countries from the BIS database for which the counterparty-country was India. The flows under consideration in our analysis are international claim and liabilities. Since the Reserve Bank also compiles data on basis of LBS statements of BIS, we are assuming the data to be comparable with BIS's LBS. The data for network analysis pertains to Q1 of 2018. In our analysis, the total number of countries in the analysis of liabilities is 38 and in case of claims is 58.

To formalise our analysis, we are borrowing the Matrix Approach to the network analysis as adopted by Minoiu and Reyes (2013). Following them, we define the Matrix X with rows showing the lenders and the column representing borrowers. The cell x_{ij} , hence, represents, the weighted liabilities (or claim, as the case may be) of country i towards country j . The corresponding adjacent matrix is defined as A_p , where an element a_{ij} takes a value of 1 if x_{ij} is non-zero, and 0 otherwise. We used total flow from country i to country j as weights in our analysis and rescaled them for charting purpose using in-built algorithm in Gephi 0.9.2, an open source software for network analysis. We will be finding out the following for our sample:

- a. Node degree (in-degree and out-degree) and Weighted Node degree (weighted in-degree and weighted out-degree)

This measure gives the number of links for each node in a network. In the present analysis, we have a directed network (liabilities or claims of country i towards country j), therefore, the network has links which are outgoing as well as incoming. Hence, we also define out-degree and in-degree which are the number of outgoing and incoming links, respectively. However, since the information in BIS is not complete as not all the countries are reporting the detailed data, these measures may not reflect actual reality. Hence, we will give the weighted out-degree and weighted in-degree measure where the weights of edges are used. Further, the weight degree which is the sum of weight in-degree and weighted out-degree will also be calculated. These measures capture the centrality of the nodes as gauged by the level of their connectivity with the other nodes in a network.

- b. Connectivity

It is one of the measures to capture the density of the network under observation. It is defined as the ratio of number of edges which exist in a network to the total number of edges which are possible between the nodes of the give network.

- c. Betweenness Centrality

For a given node in a network, betweenness centrality may be defined as the relative frequency of its appearance in the shortest paths that exists between other pairs of nodes. This is also reflective of the importance of a country in the flows in a network.

5. International Exposure of Banks in Indian Context

The Indian banks have been engaged in international operations for the past many decades. However, as Kulkarni (1980) put it, the Indian banks were involved more in operations related to retail banking and foreign exchange business opportunities overseas rather than in international banking in the real sense and the same was reiterated in Verghese (1988). The reforms in Indian banking in the post-liberalisation era gave some impetus to the international operations of the Indian banks. However, the Indian banks operating cross-borders are still subjected to a number of regulations and restrictions. The international banking transactions are regulated by the Reserve Bank of India under the Foreign Exchange Management Act, 1999 (FEMA). The Act empowers the central bank to frame regulations to prohibit, restrict and regulate the opening, holding and maintaining of foreign currency accounts and the limits up to which amounts can be held in such accounts by a person resident in India. Further, the maintenance of deposits/accounts between a resident in India and a person outside is also regulated by the Reserve Bank under the same Act. The Reserve Bank under the FEMA Act, 1999 also frames the regulation for foreign exchange business conducted by the banks with their customers/constituents and issues directions for laying down the modalities with a view to implementing these regulations. Broadly speaking, the international banking transactions in India remain regulated under the overall partial capital account convertibility framework prevalent in India.

5.1 Some Stylised Facts

The statement on international liabilities/claims of banks classified according to type of instrument is presented in Table 1. As can be clearly seen, around one-third of the liabilities are in form of loans and deposits and even within this category, the money deposited under various accounts and schemes offered to the non-resident Indians (NRIs) is the major contributor. These NRIs deposits have been found to be positively related to relative interest rates, LIBOR and negatively related to political and geopolitical risks as well as external events like financial crises (Gordon and Gupta, 2004).

As far as claims are concerned, owing to regulations on international banking lending activities, the claims of Indian banks are, on the majority, loans to non-resident and foreign currency loans to residents. NOSTRO Balances and Placements Abroad form the major part of the claims. The other major category is outstanding export bills. The international liability to claim ratio for India is 2.1 showing the dominance of deposits in the international banking activities in the country. The overview of India's international liabilities and claims clearly show that cross-border banking in India is mostly restricted to catering the needs of the NRIs, exporters and foreign currency loans to the residents.

Table 1
International Liabilities/Claims of Banks Classified According to Type of Instruments
(Based on LBS Statements)

Amount in US\$ Million

Liabilities Category	March - 2018	Claims Category	March - 2018
1. Loan & Deposits	153747.1 (77.8)	1. Loans & Deposits	89572.6 (97.6)
Foreign Currency Non-resident Bank [FCNR (B)] Scheme	22036.3 (11.2)	Loans to Non-residents	30150.4 (32.9)
Resident Foreign Currency (RFC) A/Cs	265.5 (0.1)	Foreign Currency Loan to Residents	23583.6 (25.7)
Exchange Earners Foreign Currency (EEFC) A/Cs	4054.4 (2.1)	Outstanding Export Bills	13695.9 (14.9)
Other Foreign Currency Deposits (including Inter-bank foreign currency deposits)	1193.3 (0.6)	Foreign Currency in hand, Travelers Cheques, etc.	150.6 (0.2)
Foreign Currency Borrowing (Inter-bank borrowing in India and from abroad, external commercial borrowings of banks)	23073.3 (11.7)	NOSTRO Balances and Placements Abroad	21992.1 (24.0)
VOSTRO Balances and Balances in Exchange Houses and in Term Deposits	988.5 (0.5)		
Non-Resident External Rupee (NRE) Accounts	84643.5 (42.9)		
Non-Resident Ordinary (NRO) Rupee Accounts	12117.0 (6.1)		
Embassy Accounts	150.9 (0.1)		
Foreign Institutional Investors (FII) Accounts	5145.1 (2.6)		
ESCROW A/Cs	79.2 (0.0)		
2. Own Issues of International Securities	177.88 (0.1)	2. Holdings of Debt Securities	1416.50 (1.5)
Bonds	177.9 (0.1)	Investment in Foreign Government Securities	1416.5 (1.5)
Other Own Issues of International Debt Securities	-	Investment in Other Debt Securities Abroad	-

Liabilities Category	March - 2018	Claims Category	March - 2018
3. Other International Liabilities	43591.4 (22.1)	3. Other International Assets	768.5 (0.8)
ADRs/GDRs	6942.2 (3.5)	Investments in Equities Abroad	172.9 (0.2)
Equities of Banks Held by Non-residents	21416.7 (10.8)	Capital supplied to and receivable profits from foreign branches of Indian banks and other unclassified intl. assets	595.6 (0.6)
Capital/Remittable Profits of Foreign Banks in India and Other Unclassified International Liabilities	15232.5 (7.7)		
Total International Liability	197516.36	Total International Asset +	91757.66

+ : In view of the incomplete data coverage from all the branches, the data reported under the LBS are not strictly comparable with those capturing data from all the branches.

'-' : nil or negligible.

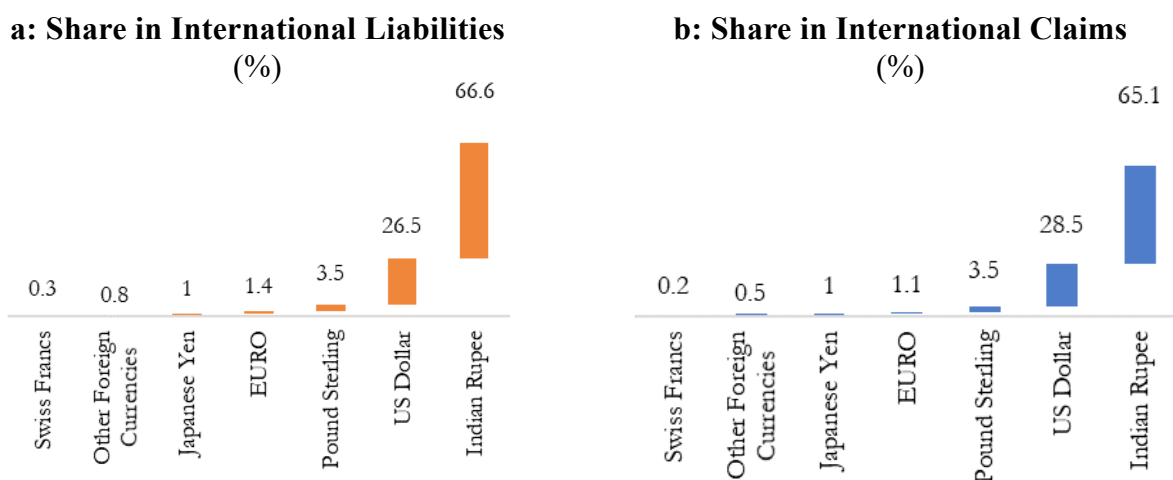
Figures in parentheses are percentages to total.

Source: International Banking Statistics, Database on Indian Economy, RBI's Data Warehouse.

5.1.1 Currency Denomination of International Liabilities/Claims

Around 65% of international liabilities as well as international claims are denominated in Indian rupees (Chart 4a and 4b). As far as liabilities are concerned as we discussed earlier, various accounts and schemes offered to the NRIs form its major share and most of these are denominated in Indian rupee only. This higher proportion of Indian rupee in international liabilities and claims translates into lower currency risks for the Indian banks.

Chart 4
Share of Currencies of International Liabilities/Claims (Based on LBS Statements)

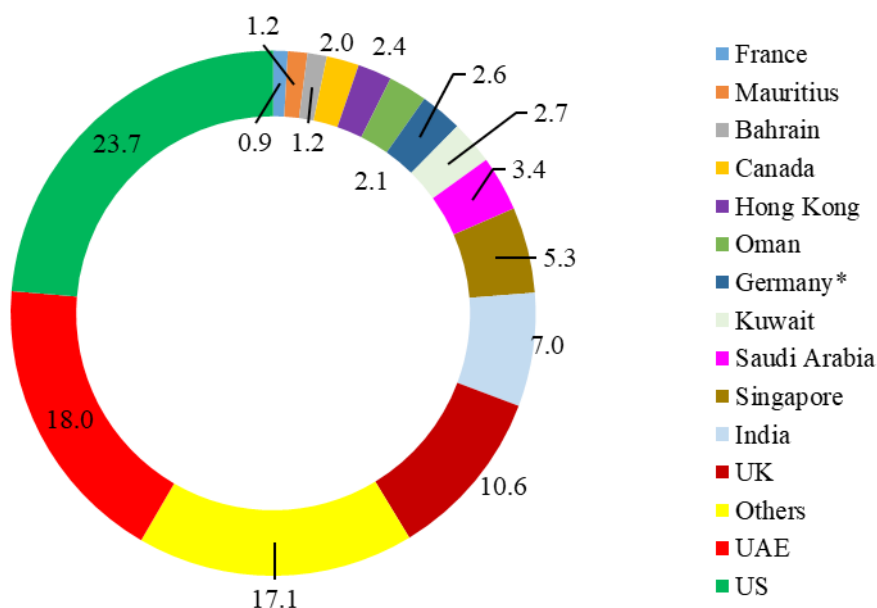


Source: Author's calculation based on International Banking Statistics, Database on Indian Economy, RBI's Data Warehouse.

5.1.2 Country of Residence in International Liabilities

The top three country of residence with the highest share in the international liabilities is the UAE, USA and United Kingdom. Many of these countries host significant part of Indian diaspora abroad and hence, are major source for NRI deposits in India (Chart 5).

Chart 5
Country of Residence in International Liabilities of India (Based on LBS Statements)

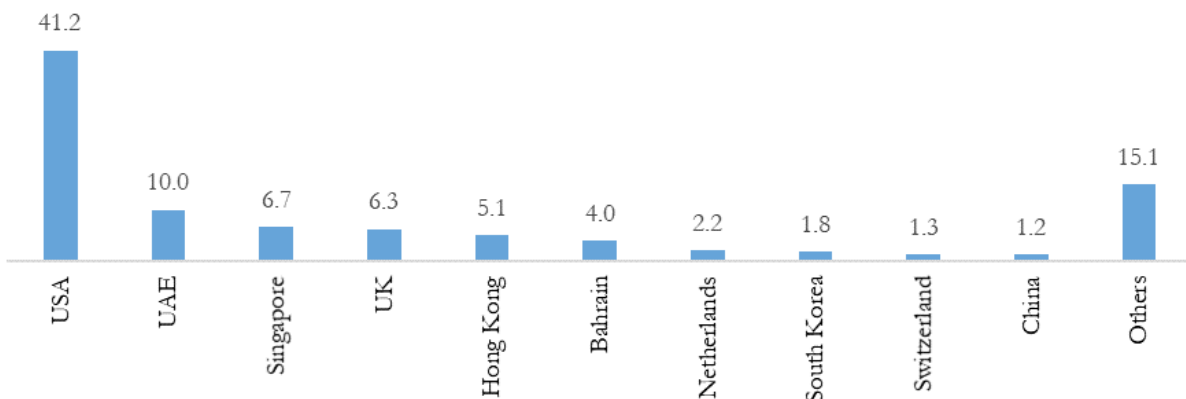


Source: Author’s calculation based on International Banking Statistics, Database on Indian Economy, RBI’s Data Warehouse.

5.1.3 Consolidated International Claims

The data shows that in the case of consolidated international claims of banks on immediate country risk basis, the highest proportion is that of the USA, followed by UAE, Singapore, UK and Hong Kong (Chart 6). While USA and UK are important international financial centres, Singapore and Hong Kong are important offshore financial centres. Hence, the risk materializing in these economies in general and banking sector in particular, may have potential spill over effects on India.

Chart 6
Share of Country of Transacting Units in Consolidated International Claims of Banks
(Based on CBS Statements) in % - on Immediate Country Risk Basis



Source: Author's calculation based on International Banking Statistics, Database on Indian Economy, RBI's Data Warehouse.

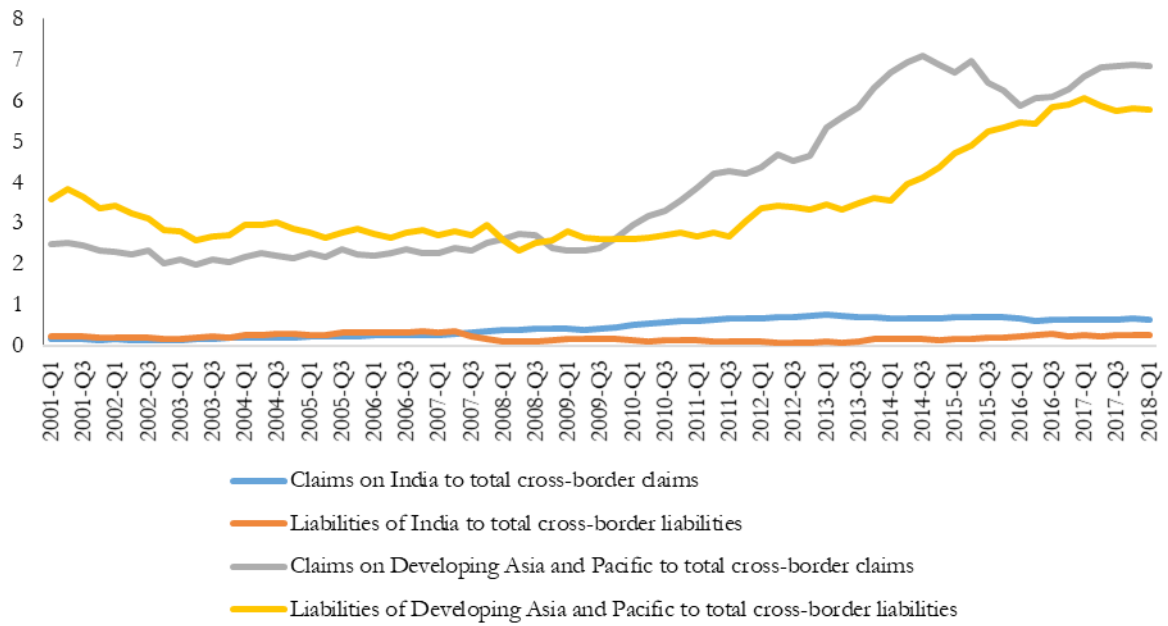
5.1.4 Indian Cross-border Banking: An International Comparison

Despite the increasing share of India in global cross-border banking activity, its share remains very low (Chart 7). This may be attributed to the regulations on borrowing and lending across borders. In fact, among BRICS (Brazil, Russia, India, China and South Africa) the share of India is also not very significant (Chart 8). In fact, the share of India in cross-border claims has been more or less the same for the preceding period, during and after the great financial crisis of 2008. Hence, in context of global international banking scenario, the role of India is limited.

5.2 Indian Banking during Recent International Crises

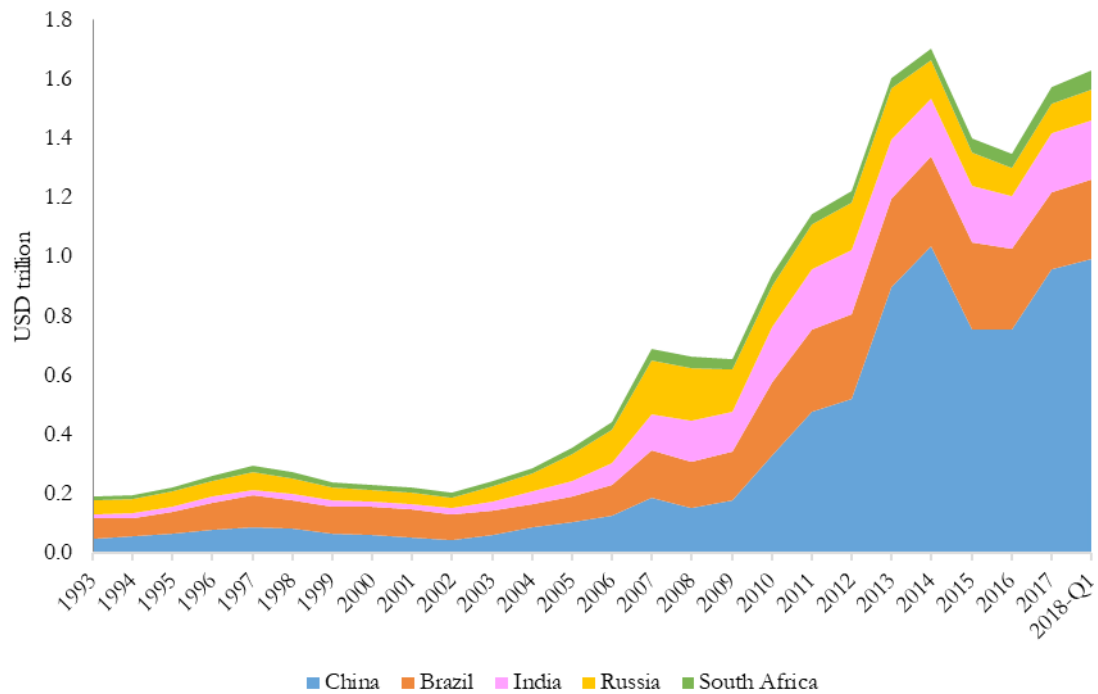
Owing to the regulations on international banking activities in the country, Indian banking remained shielded during international crises of the recent past. The Indian banks continued to operate normally in the aftermath of the global financial crisis as outlined in Kumar and Vashisht (2009) and Sinha (2011). The main reasons cited for the normal functioning was the limited exposure of Indian banks to troubled assets, the prudential regulations by the regulator and limited presence of foreign banks in India (Sinha, 2011). However, indirect effects of the crises impacted Indian banks by putting pressure on domestic liquidity on the back of sudden reversals of foreign capital (Kumar and Vashisht, 2009). The Reserve Bank took a number of measures to ease liquidity conditions to ensure normalcy (see Sinha, 2011 for details).

Chart 7
Shares Pertaining to India and Developing Asia and Pacific in Total Cross-border Positions in % (Based on LBS Statements)



Source: Author’s calculation based on Locational Banking Statistics, BIS.

Chart 8
Cross-border Claims on BRICs Countries



Source: Author’s calculation based on Locational Banking Statistics, BIS.

6. Network Analysis of Cross-border Banking in the Indian Context

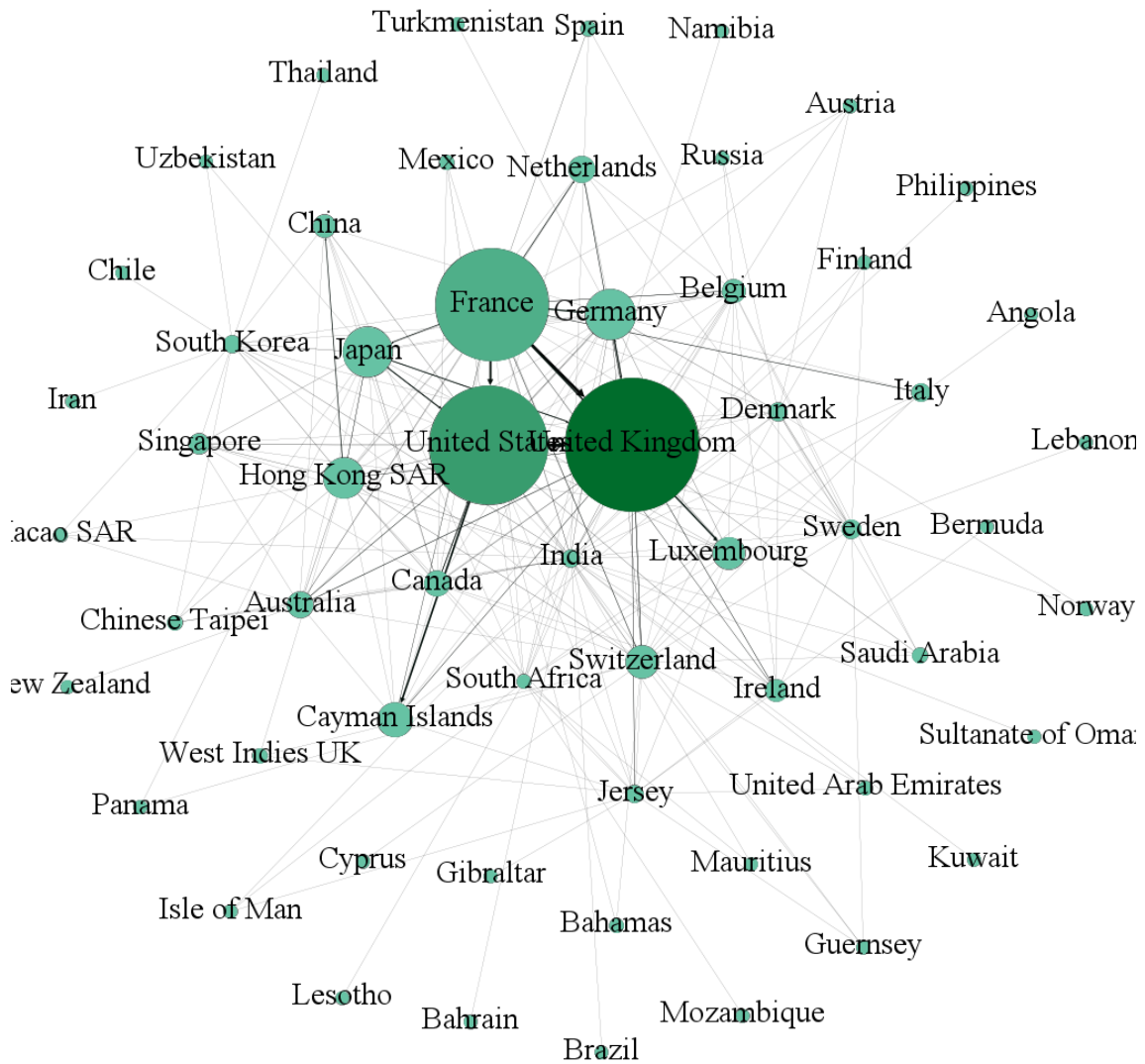
Following the methodology described in Section 4, we now discuss the cross-border banking network keeping India in focus. As discussed in the preceding section, cross-border banking in India remains somewhat muted. We first discuss the network analysis in context of cross-border liabilities, followed by a discussion on cross-border claims. The network created, using the data as described in Section 4, the network for our sample is indicated in Chart 9. Among India's major counter-parties in case of cross-border liabilities, United States, United Kingdom, France, Germany and Japan are the most connected, as indicated by their weighted degrees. The ranking of the top ten countries along with the ranking of India is presented in Table 2. The network connectivity is 0.07 for this case. The network pertaining to cross-border claims is presented in Chart 10, followed by the ranking of major countries and India on different network measures in Table 2. The results as tabulated show that role of India is not that prominent, in spite of the fact that our data was focused on India. The network connectivity is computed to be 0.11. The highest rank of India in case of between centrality is because of the nature of our sample as we have included countries focusing on India. In case of cross-country claims as well, the role of India is depicted in terms of ranks. However, the results of this data come with the caveat that the analysis has been done on a limited number of countries. In the analysis of the entire set of countries, the results may differ from the current results. Overall, countries like United States, United Kingdom, France, Germany and Japan are among the most important players in the cross-border banking network pertaining to India.

Table 2
Network Measures for Cross-country Liabilitie

Weighted In-Degree	Weighted Out-Degree	Weighted Degree	Betweenness Centrality
United Kingdom	France	United Kingdom	India
United States	United Kingdom	United States	United Kingdom
Cayman Islands	United States	France	Jersey
Germany	Japan	Germany	Germany
Luxembourg	Hong Kong SAR	Japan	Hong Kong
Japan	Germany	Hong Kong	France
Netherlands	Australia	Cayman Islands	South Africa
France	Switzerland	Switzerland	Switzerland
China	Canada	Luxembourg	United States
Ireland	Belgium	Netherlands	Denmark
India's Rank			
24	15	22	1

Source: Author's calculation based on data taken from Locational Banking Statistics, BIS and International Banking Statistics, Database on Indian Economy, RBI's Data Warehouse. The total number of countries in the analysis is 58.

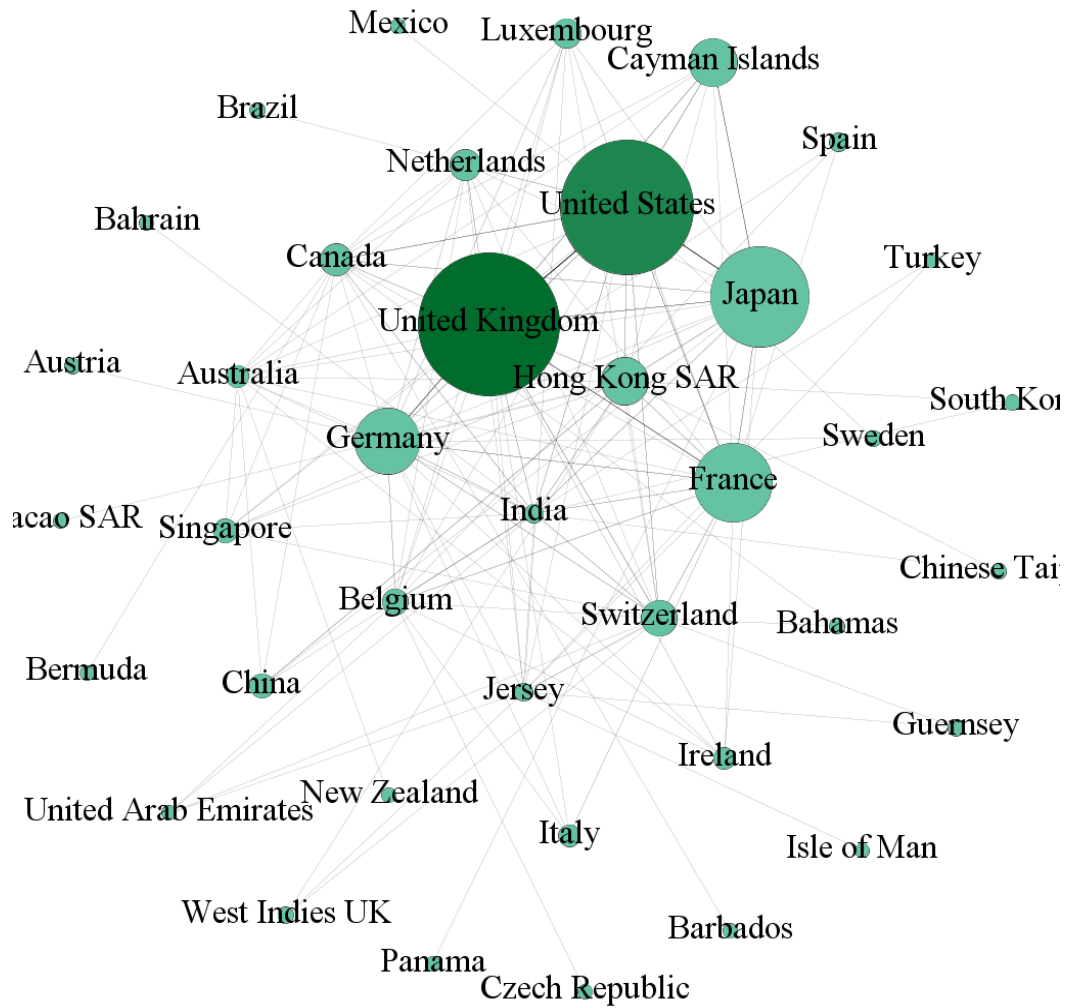
Chart 9
Network Analysis of Cross-border Liabilities in the Indian Context



Source: Author’s calculation based on data taken from Locational Banking Statistics, BIS and International Banking Statistics, Database on Indian Economy, RBI’s Data Warehouse.

Note: The sizes of the nodes are representing weighted degree. The width of the edges represents the scaled weights. Nephi 0.9.2 has been used for the creation of the chart.

Chart 10
Network Analysis of Cross-border Claims in Indian Context



Source: Author’s calculation based on data taken from Locational Banking Statistics, BIS and International Banking Statistics, Database on Indian Economy, RBI’s Data Warehouse.

Note: The sizes and shades of the nodes are representing weighted degree. The width and shade of the edges represent the scaled weights. Gephi 0.9.2 has been used for the creation of the chart.

Table 3
Network Measures for Cross-country Claims

Weighted In-degree	Weighted Out-degree	Weighted Degree	Betweenness Centrality
United States	United Kingdom	United Kingdom	India
United Kingdom	Japan	United States	Switzerland
Cayman Islands	United States	Japan	Germany
France	France	France	United States
Japan	Germany	Germany	Hong Kong SAR
Germany	Hong Kong SAR	Cayman Islands	France
Netherlands	Switzerland	Hong Kong	Canada
Luxembourg	Canada	Switzerland	United Kingdom
China	Australia	Canada	Belgium
Singapore	Belgium	Netherlands	Japan
India's Rank			
18	13	19	1

Source: Author's calculation based on data taken from Locational Banking Statistics, BIS and International Banking Statistics, Database on Indian Economy, RBI's Data Warehouse. The total number of countries in the analysis is 38.

7. Conclusion

The banking sector has evolved through various stages in the country reflecting the financial needs of a growing economy. The banks in India continue to play a very important role in the country's economic process. The banking sector in the country is the most predominant player in the Indian financial system in terms of resources provided to the commercial sector, channelling household savings and hence, playing an important role of financial intermediation. Further, its share in the financial sector network in India is the most significant in terms of bilateral flows. The continued efforts by the regulator and government have contributed to making the sector more efficient, enabling it to play a crucial role in financial intermediation. The recent challenges facing the Indian banks in the form of asset quality are also being managed with new policies to ensure their speedy resolution. At the same time, regulations and supervision ensure that the sector remains robust against the various risks.

With liberalisation, the pace of globalisation of the Indian economy has also increased. In the context of global cross-border banking scenario, the Indian banking sector's international operations are subject to regulations prescribed by the central bank in the purview of the existing legal framework under the overarching partial capital account convertibility. Most of the international operations of the banking sector in India are devoted to catering to the needs of NRIs, exporters and foreign currency credit needs of residents. Further, most of the international liabilities and claims are denominated in Indian rupees lowering the currency risks. The cross-border banking activities

for banks operating in India are subject to prudential regulations which translate to lower exposure for these entities to cross-border risks. Further, the presence and operations of foreign banks in India is also limited. In this scenario, cross-border contagion risks remain limited for the country as seen by the India's banking sector's experience in the wake of the global and regional financial crises of the recent past. The results from our observations and analysis using the BIS global datasets and the Reserve Bank's data also point towards the same and show that the role of India is not that significant in the global banking network. The results from the network analysis corroborated these findings where the ranking of India in the network measures among the major countries with which it shares cross-border banking relations is not very high. The prudential approach of the country in terms of cross-border banking operations has shielded the banking sector from the effects of the crisis that originated in foreign countries.

References

- Acharya, Shankar, (2001), “India’s Macroeconomic Management in the Nineties,” *Working Paper*, ICRIER, New Delhi, Available at: <https://www.imf.org/external/pubs/ft/wp/2004/wp0448.pdf>
- Agenor, Pierre-Richard, (2003), “Benefits and Costs of International Financial Integration: Theory and Facts,” *The World Economy*, Volume 26, Issue 8, pp. 1089-1118.
- Allen F. and D. Gale, (2000), “Financial Contagion,” *Journal of Political Economy*, 108(1), pp. 1-33.
- Banerjee A.V.; S. Cole and E. Duflo, (2004), “Banking Reform in India,” in India Policy Forum 2004, Volume 1, (Eds.) S. Bery, P. S. Bosworth and A. Panagariya.
- Borio, C., (2014), “The International Monetary and Financial System: Its Achilles Heel and What To Do About It,” *BIS Working Papers*, No. 456, September.
- Borio, C. and P. Disyatat, (2011), “Global Imbalances and the Financial Crisis: Link or No Link?” *BIS Working Papers*, No. 346, May, Revised and Extended Version of “Global Imbalances and the Financial Crisis: Reassessing the Role of International Finance,” *Asian Economic Policy Review*, 5, 2010, pp. 198–216.
- Borio, Claudio; Harold James and Hyun Song Shin, (2014), “The International Monetary and Financial System: A Capital Account Historical Perspective,” *BIS Working Papers*, 457, Bank for International Settlements, Available at: <https://www.bis.org/publ/work457.pdf>
- Cerutti, Eugenio; Stijn Claessens and Patrick McGuire, (2014), “Systemic Risks in Global Banking: What Available Data Can Tell Us and What More Data Are Needed?” in Risk Topography: Systemic Risk and Macro Modeling, (Eds.) Markus Brunnermeier and Arvind Krishnamurthy, National Bureau of Economic Research.
- Degryse, Hans and M. A. Elahi. and María Fabiana Penas, (2009), “Cross-Border Exposures and Financial Contagion,” *TILEC Discussion Paper*, No. 2009-008, March 19, Available at: <https://ssrn.com/abstract=1365115> or <http://dx.doi.org/10.2139/ssrn.1365115>
- Degryse, Hans and Grégory Nguyen, (2007), “Interbank Exposures: An Empirical Examination of Contagion Risk in the Belgian Banking System,” *International Journal of Central Banking*, 3, Issue 2, pp. 123-171.
- Dungey, M. and D. Gajurel, (2015), “Contagion and Banking Crisis – International Evidence for 2007–2009,” *Journal of Banking & Finance*, 60, pp. 271-283.
- Forbes, Kristin, (2012), “The ‘Big C’: Identifying and Mitigating Contagion,” 36th Jackson Hole Symposium.
- Gabrieli, S.; D. Salakhova and G. Vuillemeys, (2015), “Cross-border Interbank Contagion in the European Banking Sector,” *Banque de France Working Paper*, 545, Available at: https://www.banque-france.fr/sites/default/files/medias/documents/working-paper_545_2015.pdf

- Gordon, James P. and Poonam Gupta, (2004), “Nonresident Deposits in India: In Search of Return?” *IMF Working Paper*, 04/48, International Monetary Fund
- Government of India, (2018), Economic Survey 2017-18.
- Gropp R.; M. Lo Duca and J. Vesala, (2009), Cross-border Bank Contagion in Europe, *International Journal of Central Banking*, March, pp. 97-139.
- Hüser, Anne-Caroline, (2015), “Too Interconnected to Fail: A Survey of the Interbank Networks Literature,” *SAFE Working Paper*, No. 91, Available at: <https://ssrn.com/abstract=2577241> or <http://dx.doi.org/10.2139/ssrn.2577241>
- Kulkarni G. R., (1980), “International Dimensions of Indian Banking,” *Economic and Political Weekly*, 15(48), pp. M127-M146.
- Kumar, R. and P. Vashisht, (2009), “The Global Economic Crisis: Impact on India and Policy Responses,” *ADB Working Paper*, 164, Tokyo: Asian Development Bank Institute. Available at: <http://www.adbi.org/working-paper/2009/11/12/3367.global.economic.crisis.india/>
- Minoiu C. and J. A. Reyes, (2013), “A Network Analysis of Global Banking: 1978–2010,” *Journal of Financial Stability*, 9 (2013), pp. 168–184.
- Mohan, R. and P. Ray, (2017), Indian Financial Sector: Structure, Trends and Turns, IMF working paper, WP/17/7
- OECD (2012), “Financial Contagion in the Era of Globalised Banking?” *OECD Economics Department Policy Notes*, No. 14, June.
- Park, Cyn-Young and Kwanho Shin, (2017), “A Contagion Through Exposure to Foreign Banks During the Global Financial Crisis,” *Asian Development Bank Economics Working Paper Series*, No. 516, July, Available at: <https://ssrn.com/abstract=3187781> or <http://dx.doi.org/10.2139/ssrn.3187781>
- Prakash A.; A. K. Shukla; A. P. Ekka and K. Priyadarsh, (2018), Quarterly Estimates of Households’ Financial Assets and Liabilities, RBI Bulletin, March, pp. 11 – 18.
- Prasad E. S., (2010), “Financial Sector Regulation and Reforms in Emerging Markets: An Overview,” *IZA Discussion Paper*, No. 5233, Institute for the Study of Labor, Switzerland.
- Ramasastri A. and A. Samuel, (2006), “Banking Sector Developments in India, 1980-2005: What the Annual Accounts Speak?” *Reserve Bank of India Occasional Papers*, 27 (1 and 2), pp. 177-205.
- Reserve Bank of India, (2008), Report on Currency and Finance, 2006-08, Volume-I.
- Reserve Bank of India, (2014), Framework for Dealing with Domestic Systemically Important Banks (D-SIBs).
- Reserve Bank of India, (2015), Annual Report 2014-2015.

- Reserve Bank of India, (2015a), Report of the Internal Working Group (IWG) to Revisit the Existing Priority Sector Lending Guidelines.
- Reserve Bank of India, (2016), Annual Report 2015-2016.
- Reserve Bank of India, (2016a), Master Direction - Deposits and Accounts, Available at: <https://rbidocs.rbi.org.in/rdocs/notification/PDFs/09MDD593B2F2D48648C8AB3D37625C9F245D.PDF>
- Reserve Bank of India, (2017a), Annual Report 2016-2017.
- Reserve Bank of India, (2017b), Report on Trend and Progress of Banking in India for the year ended June 30, 2017.
- Reserve Bank of India, (2018a,) Annual Report 2017-18.
- Reserve Bank of India, (2018b), Financial Stability Report, Issue No. 17.
- Samantaraya, A., (2016) “Procyclical Credit Growth and Bank NPAs in India,” *Economic and Political Weekly, Money, Banking and Finance*, 51(12), pp. 112 – 119.
- Sengupta R. and Harsh Vardhan, (2017), This Time it is Different Non-performing Assets in Indian Banks,” *Economic and Political Weekly*, 52(12), pp. 85 – 95.
- Sinha A., (2011), Impact of the International Banking Crisis on the Indian financial System, in the Global Crisis and Financial Intermediation in Emerging Market Economies, Bank for International Settlements, 2011, Vol. 54, pp. 225-234.
- Shirai S., (2002), “Banking Sector Reforms in India and China: Does India’s Experience Offer Lessons for China’s Future Reform Agenda?” *Asia-Pacific Development Journal*, 9(2), pp. 51-82.
- Tonzer, Lena, (2015), “Cross-border Interbank Networks, Banking Risk and Contagion,” *Journal of Financial Stability*, Vol. 18, Issue C, pp. 19-32.
- Upper, C., (2011), “Simulation Methods to Assess the Danger of Contagion in Interbank Markets,” *Journal of Financial Stability*, 7 (3), pp. 111-125.
- Upper, C. and A. Worms, (2004), “Estimating Bilateral Exposures in the German Interbank Market: Is there a Danger of Contagion?” *European Economic Review*, 48(4), pp. 827–849.
- Verghese, S. K., (1988), “Developments in International Banking and Prospects of Indian Banks’ Overseas Business,” *Economic and Political Weekly*, 23(18), pp. 899-908.