A Critical Inquiry Into ‘Finance-Growth’ Nexus

Thesis Re-submitted in partial fulfilment of the requirements for the award of the Degree of Doctorate of Philosophy in Arts at Jadavpur University, Kolkata.

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Certified that the Thesis entitled

A Critical Inquiry Into 'Finance-Growth' Nexus Re-submitted by me for the award of the Degree of **Doctor of Philosophy** in Arts at Jadavpur University is based upon my work carried out under the Supervision of **Prof. Pranab Kumar Das**, Associate Professor of Economics, **Centre for Studies in Social Sciences, Calcutta (CSSSC)** and that this thesis is a revised version of the one submitted on **01/09/2023**.

It is certified further that neither this thesis nor any part of it has been submitted before for any degree or diploma elsewhere.

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Chapter – 1

Introduction

1.1 Objective and Motivation

Present thesis empirically investigates the interaction between the financial development and economic growth and intends to propose 'three chapters' to identify, in sequence, whether and how such an interrelationship manifests for an economy. Along with the production and investment side of the economy, it also considers the implications of such interconnection on income inequality of that economy as well. From this perspective, present thesis is an economy–specific study of India, an emerging economy, that has gained global importance in recent times.

The choice of Indian economy presents a very unique case among the emerging economies for the evolutionary background of her financial sector and impressive growth story. Firstly, she has evolved into an emerging economy by surpassing the popular Clark–Fisher theory of growth and exists as a mixed economy where both private and public sector co–exist and participate in the growth process under the general guidance of economic planning until the economic reforms of 1990s. Further, unlike many other low to low-medium income economies, Indian financial sector and monetary policy framework have remained a key component of her overall reforms in providing the foundation for achieving the increased price and financial stability. Reforms in these sectors have been well–sequenced, gradual, cautious, and steady in process, devoid of many flourishes that could be observed in other countries due to the market conditions of various segments.

From this perspective, present thesis approaches the research in three parts. In first part, our period of study spans the post–republic years of 1951–2017 to understand whether there exists any relationship between the financial and the real sector or not. Then in next part, it spans from 1972–2019, i.e., the post–nationalisation period in extracting how such relation has manifested itself overtime and what role does it play in explaining the inter–sectoral linkages. Finally, we investigate the implications of such an interrelationship on 'income–inequality' by considering the liberalisation and post-liberalisation period of 1990–2012. In this way, we have tried to cover the different phases of the Indian economic growth and financial development.

1.2 Literature Review

Literature around the various (legal, political, regulatory, policy etc.) linkages between the financial development and economic growth dates back to the days of Bagehot (1873) who initiated the discussion surrounding the importance and significance of financial intermediaries for the real sector growth. In later years, a debate arose between the economists due to Schumpeter (1912) understanding of 'growth follows finance' (Schumpeterian view) and Robinson (1952) understanding of 'finance follows growth' (Robinsonian view). Following this debate, over the period of time, economists have engaged themselves in collecting evidence in favour of these views. This has resulted into several studies (both theoretical and empirical) on various implications and manifestations of the 'finance–growth' nexus. We discuss some of them here to provide an overview of the broader field while the chapter–specific ones are saved for the respective chapters.

In years following the stagflation of 1970s, economists have shifted their focus in identifying the existence of potential as well as the plausible alternative determinants of the long–run economic growth from the financial sector and how the development of the later sector could contribute in shaping the trends and dynamics of the former. Possibly, outcome of such studies could have direct policy implications for finance and as such, might constitute the backbone of any nation – developed, developing (aka emerging) or underdeveloped. It is to be noted here that the functioning and efficiency of the financial sector, in general, derives from a number of intricately related factors like – prevailing financial regulatory framework, legal structures, other socio–political and historical set–ups etc.

As financial institutions, banks are significant particularly for the following purposes – (i) accepting household savings in the form of interest bearing deposits, (ii) channelising deposits to a large number of agents awaiting capital for various investment purpose in the form of interest bearing lending, (iii) issuing liabilities that are more liquid than their primary assets, (iv) reducing need for self–financing of investment and (iv) eliminating the household cost of acquiring information for productive investment of their savings. Besides, in an atmosphere characterised with information asymmetry regarding the returns of an investment project, lending to entrepreneurs require both ex–ante evaluation and ex–post monitoring of the same. These, in turn, involve specific set of skill as well as cost which appears to be both unrealistic and prohibitive for an individual investor to bear and carry out on his own. Banks, instead could exploit the law of large numbers in forecasting the unsuccessful projects and the returns therefrom and hence are far more efficient in conducting such an ex–ante and ex–post tasks (Williamson, 1987; Levine, 2005).

Evidently, in lieu of perfect insurance in markets for loans, banks emerge as an institution that ensure safe returns by mobilising savings into investment projects (Diamond & Dybvig, 1983). This implies that for the risk–averse households, holding savings in the form of bank deposits ensure low but safer returns compared to its more volatile as well as unsafe counterparts, the high return equities. In this spirit, banks and other financial intermediaries are conducive of real sector growth in the long run. Such contribution of the financial intermediaries towards the real sector is highly instrumental in case of developing and under developed economies.

Despite such an implication of the financial intermediaries, economists over the ages have contested with diametrically opposite school of thoughts. At one end, the influential works of Schumpeter (1912), Gurley and Shaw (1955, 1967), Goldsmith (1969) along with their predecessor Bagehot (1873) have projected the importance and significance of financial intermediaries in causing the real sector growth. Their followers, Fry (1988) and Pagano (1993) have also contributed in strengthening the proposition further. At this juncture, scholars of endogenous growth literature, like Bencivenga and Smith (1991), Bencivenga, et al. (1995), Greenwood and Jovanovic (1990) amongst others, have argued that financial development impacts the steady state growth positively. On the contrary, pioneers like Robinson (1952), Lucas (1988), Miller (1998) on the other end, hold that it is the real sector that contributes to the development of the financial markets and institutions and not the other way round.

To this debate, there exists a third perspective as well due to Van Wijnbergen (1983) and Buffie (1984) that contends that finance affects growth in a negative way. According to them, due to formal development of the financial sector, borrowers switch from informal to the formal sector for loans and such a shift ends up hurting the growth process by shrinking the total credit available for real sector. In this regard, Singh (1997) observes that development of financial markets might be an impediment to economic growth when it induces volatility and thereby discourages risk–averse investors from investing. Besides, Mauro (1995) finds that the financial tools which help individuals to hedge against risk could reduce their precautionary saving and therefore, might retard the economic growth as well.

In context of whether financial development in the form of financial deepening contributes to the growth or not, McKinnon (1973) and Shaw (1973) deserves a special mention for two purposes – (1) contrary to the neo–classical belief that lower interest rate could enhance growth, they emphasise that in case of less developed countries (LDCs), the outcome is actually the opposite and (2) unlike Goldsmith (1969) where focus remained on efficiency of investment, McKinnon–Shaw emphasises on financial liberalisation and public policies regarding financial markets to play a crucial role for increasing the savings and investment and finally, the growth.

In this regard, it is to be noted here that interest rate always has a negative impact on investment but an indeterminate impact on savings. With the development of the financial sector, economy begins to switch more and more towards the formal credit from informal credit. In other words, more and more loans enter into the regulated domain of formal credit. In absence, of any regulation, informal sector usually charges interest rates for the borrowing and lending rate at the market clearing level. On the contrary, as the economy enters the formal sector, it experiences decrease in both borrowing rate, lending rate as well the difference between the two (interest rate spread). However, such an 'interest rate based' transmission mechanism has not been considered in the present thesis. Instead, the transmission mechanism (to be discussed shortly) considered is that of the allocation of credit.

In the literature concerning development economics, credit from banks and other financial institutions have always been considered as the main source of finance for economic activities (Blinder 1987; Blinder & Stiglitz, 1983; Taylor, 1983 amongst others). This consideration, however, remains confined to the organised part of the economy only. Further, it has generally been argued in case of LDCs that various informational problems remains so pronounced in those countries that they become inconducive to the development of the capital markets as source of finance. Therefore, banks and other financial institutions, have been advocated as the most appropriate financial institutions for these economies.

From this perspective, India, as an LDC, has eventually emerged as a typical example of how financial system has emerged in many developing countries through government intervention. Like many developing countries, India, herself has a long history of an established stock market, however, such market could hardly emerge as the major source of finance until recently. Further, due to the absence of private sector participation in financial markets, either public sector banks and other non-banking financial institutions got established or those existing in private sector were nationalised. In this way governments gained control over the financial resources and there were government directives on loan allocation to different sectors with emphasis on priority sector. The interest rates were administered and generally set at a rate lower than the market clearing rate. Government intervention took the form of administered interest rates — both deposit and lending — and directed credit programmes. This led to a large scale credit rationing which together with the lower than market clearing rate had led to a situation where allocation of credit became the channel through which transmission mechanism worked. Such policies have led to what McKinnon (1973) and Shaw (1973) described as the 'financial repression'.

Further, under the regime of administered interest rate in loan market, an excess demand often emerges because the real interest rate is usually set at a very low level. Although, in India, the regime came to an end with the onset of financial liberalisation, in early 1990s, however, it did not imply the beginning of a regime of market clearing interest rates. Under the circumstances where banks fail to distinguish between riskier and safer loans a priori, they usually prefer to charge a lower interest rate which discourages risky investors from asking for bank loans. This eventually leads to an excess demand in the loan market and consequent rationing of credit (Stiglitz & Weiss, 1981). Thus, present thesis holds that the transmission mechanism between the real and financial sector no more operates through the interest rates but via the allocation of credit. In this respect, Das and Guha-Khasnobis (2008) observes that the existing econometric literatures on finance and growth do not adequately consider this phenomenon but relate the degree of financial intermediation with income growth only.

Regarding economic growth in underdeveloped economies, Patrick (1966) argues that throughout the development process of an economy, the 'so–called' causal relationship between the economic growth and financial development can exhibit in different directions. In this regard, two phenomena have been put forward – 'demand–following' and 'supply–leading'. While the former phenomenon is exactly in tune with the 'Robinsonian view', the later finds itself in similar relationship with the 'Schumpeterian view'. Therefore, the direction of causality implied by 'demand–following' phenomenon runs 'from growth to finance' whereas 'supply–leading' indicates the same 'from finance to growth'. Furthermore, studies like Demetriades and Luintel (1996), Luintel and Khan (1999) amongst others indicate that the relationship could even be 'bi–directional' in nature i.e. 'from growth to finance as well as from finance to growth'. The whole issue therefore, reduces to a debate of the kind of 'whether the chicken or the egg came first' (Shan et al., 2001; Fukuda, 2018). Present thesis explores this debate from an empirical perspective by adopting the vector autoreggression (VAR) methodology (to be discussed in next section and at greater length in subsequent chapters).

While the direction of the nexus of 'finance–growth' remains unresolved, their importance for each other could not be undone. Financial sector indeed mobilises the capital required for materialising the large projects (both industrial and service) that drive the development of an economy on its trajectory of growth and help 'taking–off'. At this juncture, economists began to knit their brows at the question of – 'who benefits from such growth'. This leads to a battery of research works aiming at unveiling the dynamics of finance (rather, financial intermediation) and income inequality. Unfortunately, little could be clearly identified because the conclusions remain highly controversial (Ang, 2010). While Rajan and Zingales (2003) identifies the richer section of the economy to get benefitted from the development of formal financial sector, a second group of researchers (Banerjee & Newman, 1993; Galor & Zeira, 1993; Aghion & Bolton, 1997; Mookherjee & Ray, 2003 amongst others) emphasise on human capital formation and observe that financial development allowing correction of market imperfections could alleviate such income inequality.

There is a third strand of research due to Rosenzweig and Wolpin (1993), Paulson and Townsend (2004), Demirgüç–Kunt and Levine (2009) and others which emphasises on the micro foundations of banking, i.e., the channels through which savings behaviour affect the intergenerational income dynamics. In this regard, Demirgüç–Kunt and Levine (2009) observed that financial development could affect income inequality indirectly by changing the labour demand. Based upon whether financial services are boosting the demand for low–skilled or high–skilled labourers, wages of that particular section of labourers will increase and therefore, income inequality as well could either decrease or increase. Zhuang et al. (2009) for poverty reduction and Levine (2021) for income inequality, provides a well–documented survey of such literatures.

There exists debate over the methodology of studying the interaction between real and financial sector as well. In this regard, King and Levine (1993) with their cross–country regression approach, later used by others (Cooray, 2009) exists as a benchmark in empirical analysis of the interrelationship between financial and real sector. While it well establishes the fact that financial intermediation has strong positive impact on economic growth, the technique itself has been severely criticised by Quah (1993), Caselli et al. (1996), Neusser and Kugler (1998) for several reasons, particularly, due to the assumption of same coefficients for all the countries and therefore, causality tests could not be conducted. The strongest criticism, however, comes from Arestis and Demetriades (1997). To the same data set used by King and Levine (1993), they have applied time–series technique and contend that the question of causality cannot be satisfactorily addressed in a cross–sectional framework. More specifically, they say, "we have warned against the over–simplified nature of results obtained from cross–country regressions in that they may not accurately reflect individual country circumstances such as the institutional structure of the financial system, the policy regime and the degree of effective governance."(pp. 796–797).

Therefore, the 'average' country for which cross–country regressions must, presumably, relate to might not well exist. Following Arestis and Demetriades (1997), considerable attempts have been made by several economists over time to conduct country specific studies. To mention few are – Guncavdi et al. (1998) for Turkey, Gumede (2000) for South Africa, Gelos and Werner (2002) for Mexico, Wang (2003) for Taiwan, Koo and Maeng (2005) for South Korea, Ang and McKibbin (2007); Ang (2008) for Malaysia, Waheed (2009) for Pakistan, Anwar and Nguyen (2011) for Vietnam, Shahbaz et al. (2015) for Bangladesh, Adeniyi et al. (2015) for Nigeria, Ibrahim and Alagidede (2018) for Sub–Saharan Africa, Bigirimana and Hongyi (2018) for Rwanda, Arestis and Baltar (2019) for Brazil amongst others.

It is to be noted that time–series approach could yield unreliable results if the sample period is small. For this purpose Christopoulos and Tsionas (2004) resorts to panel context in order to increase the sample size for their study of 10 developing countries. With panel cointegration analysis, they find unidirectional causality from financial development to growth. Apart from this, Rousseau and Wachtel (2001) has cautioned that despite the proven appropriateness of time–series methodology over cross section regression technique, there are issues like mismanaged financial liberalisation in many countries in early nineties that could not be addressed satisfactorily. They suggest proper consideration of such impacts because they are at odds with the long–run nature of cointegration results. The time–series methodology, however, remained the most popular approach till date. Therefore, present thesis also adopts time–series approach due to Arestis and Demetriades (1997) in Chapter 2 and Chapter 3 while Chapter 4 adopts panel approach due to Christopoulos and Tsionas (2004) in investigating the impact of financial development on economic growth, sectoral growth cum interlinkage and income inequality of India respectively.

In all our chapters (Chapter 2 through Chapter 4) we consider that all the variables are endogenous. It is generally argued that vector autoregressive framework (VAR) is the most appropriate technique for modelling the endogenous variables and we did not deviate from that. Therefore, when variables are time-series in nature (Chapter 2 and Chapter 3) we adopt time-series VAR and when they are panel in nature (Chapter 4) we adopt panel VAR (PVAR). However, such a consideration requires further sophistication based on time-series properties of the variables. For brevity, we provide an oversight of the approach here and park the detailed discussion for the respective chapters.

As far as the estimation is concerned, it is to be noted, that estimation process requires a reduced form VAR instead of a structural form VAR. Further, it is generally observed that the time-series variables (due to trend or seasonality) could either be stationary (statistical properties like mean, variance and association between or among the variables remain unchanged over time) or non-stationary (statistical properties like mean, variance and association between or among the variables change over time) in nature. Therefore, it is a standard practice to identify the nature of variables through the application of unit-root test because that is what governs the procedure to be applied for further analysis. It is to be noted here that non-stationarity of the variables is a common (not absolute) phenomenon in 'finance-growth' literature.

From this perspective, time-series variables considered for econometric modelling in Chapter 2 and Chapter 3 happen to be 'non-stationary' and 'stationary' respectively. Therefore, Chapter 2 follows the standard approach for non-stationary variables – application of unit-root tests followed by cointegration tests, vector error correction model (VECM) and corresponding impulse response functions (IRFs) and forecast-error variance decompositions (FEVDs). On the other hand, Chapter 3 follows the standard approach for stationary variables – application of unit-root tests followed by structural VAR model (SVAR) and corresponding structural impulse response functions (SIRFs) and forecast-error variance decompositions (SFEVDs). Finally, in Chapter 4, panel-series variables considered for econometric modelling have been identified as 'non-stationary' which required us to apply the panel counterpart of the approach in Chapter 2 – application of panel unit-root tests followed by panel cointegration tests, panel vector error correction model (PVECM) and corresponding pairwise granger causality tests.

In present thesis, an attempt has been made to further investigate the unique features of 'finance–growth' nexus and collect evidence to contribute in the literature. For this purpose, we have selected the emerging economy – India to carry out our empirical investigation. India presents a unique case study as she encompasses – (i) a rich history of various forms of financial sector, particularly, banking sector controls and (ii) achieved an emerging status within 65 years of her independence by surpassing the famous Clark–Fisher framework. Such unique features have been observed in studies like Demetriades and Luintel (1996), Ang (2010), Fukuda (2018) amongst others.

During the independence in 1947, India was characterised with every feature of underdevelopment – surplus labour and low productivity in agriculture, necessity of modernisation, diversification and increased capacity building for manufacturing and an underdeveloped foreign trade. Under such circumstances, the first step towards the 'finance-growth' nexus began with The Reserve Bank (Transfer to Public Ownership) Act, 1948 when the Government of India (GOI) took over the Reserve Bank of India (RBI). In 1949, RBI was nationalised through the Banking Companies Act 1949 (later called Banking Regulation Act) and began to function as a state–owned central bank with monopoly over issuing notes. Following, the establishments of the republic status (1950) and Planning Commission (1951), RBI became responsible to provide the necessary financial support to the government in achieving the targets of the economic plans. Besides, between 1955 and 1980, several 'Development Financial Institutions (DFIs)' were established (The Reserve Bank of India: Volume 1, Volume 2) to provide better finance for the economic projects and progress of the different sectors.

With the introduction of 'Bank Nationalisation' in 1969, 'fourteen' private banks were nationalised followed by 'six' more in 1980. Such events were undertaken to encourage the credit access for the rural poor (discussed further in Chapter 3). According to Mohan (2006), Indian financial sector represents a classic example of 'financial repression' in the terminology of McKinnon (1973) and Shaw (1973) until 1990. Financial system was unable to ensure the efficient allocation of resources because there were extensive regulations, administered interest rates, directed credit programmes, weak banking structure, lack of proper accounting and risk management systems and lack of transparency in operations of the major financial market participants (Mohan, 2006). In order to create an efficient, competitive and stable financial system for facilitating an increasing contribution of this sector in stimulating growth. a large scale financial sector reforms was initiated in the early 1990's. Correspondingly, the monetary policy framework underwent transformation and made a phased shift from direct instruments of monetary management to an increasing reliance on indirect instruments. Present thesis, however, is concerned with the role of the scheduled commercial banks (SCBs) which is the backbone of the formal financial system.

For real sector, initial approach of the government remained in reforming the lands to uphold agricultural sector (First Five Year Plan, 1951–1956). Manufacturing became the primary focus during the Second Five Year Plan (1956-1961) and investments were directed to that sector. Such an approach is concomitant due to Fisher (1935, 1939) and Clark (1940) as they theorised (later known as Clark–Fisher theory of development) that the economic development happens through the structural change from pre–industrial (agricultural) to industrial (manufacturing) and finally into post–industrial (service) sectors. However, due to the failure of the Second and Third Five Year Plans because of the wars with China (1962) and Pakistan (1966, 1971), Indian economy went destabilised. Therefore, to encourage more private participants, Government of India adopted Delicensing Policy in 1970 and modified it further in 1973, 1977 and 1980. Unfortunately, such initiatives failed to deliver the desired outcome due to industrial sickness and lack of competitive environment.

Therefore, a set of new economic reforms in the form of liberalisation, privatisation and globalisation (LPG) were introduced in 1991 in order to provide a competitive and efficient environment for all the sectors. The foundation of LPG, however, was laid in 1990 when the policy of license raj came to an end. Amongst these various specifications, present thesis restricts itself to the gross output of the economy, or sectors, or of the states as applicable. Therefore, granular understanding of the dynamics of domestic product remains beyond the scope of this thesis.

By mid–1980s, India achieved self–sufficiency in agriculture but industry remained stumbling. At this juncture, the LPG transition put India's growth on the rise, specifically, due to the boom of the service sector. Post 1991, Indian economy became open to foreign investments and emerged more competitive, efficient and market–oriented. By 2011–12 (65 years of independence), India evolved as an emerging economy from an underdeveloped economy and that too by surpassing the popular Clark–Fisher theory of growth. At the same time, the economic growth story of India features the contribution from both government and market (in phased manners and gradually) and therefore, remains a classic example of mixed economy. Here, Fukuda (2018) observes that for India, there is no consensus on whether the nexus of 'finance-growth' is supply–leading (Schumpeterian view) or demand–following (Robinsonian view) or bilateral (both).

It is to be mentioned here that when the reforms were initiated in early 1990s through a series of policies, Indian financial sector happened to reap the benefits enormously. From 8,262 and 59,752 bank branches in 1969 and 1990 respectively, there were 68,339 branches by 2005 and 1,46,192 by 2019. As far as the financial access is concerned, India remained committed in expanding the access. In 1972, only 28.8% of the total bank accounts were held by the household sector which rose to 64.4% by 1990. In post–liberalisation years, the expansion reached to 81.9% and 91.4% of all bank accounts in 2005 and 2019 respectively. Deposits that accounted for only 15.5% of the total national income in 1969 also registered a massive boost. Compared to 1969, by 1990, 48.6% of the total national income entered the banking sector as deposits which rose to 73.9% by 2006 and to 91.8% by 2019. At the same time, credit disbursement that stood at 0.36 billion in 1969 gradually rose to 10.5 billion (in 1990), 193 billion (in 2006) and further to a mammoth of 104 trillion by 2019. Interestingly, these figures have been achieved despite the reduction in total number of SCBs from 270 (of which 196 were regional rural banks) in 1990 to 147 (of which 43 were regional rural banks) in 2019 due to 'merging of banks' in order to achieve consolidation.

In an environment characterised with operational flexibility, banking sector registered a strong growth in their balance sheet with significant improvement in capital adequacy and asset quality as well. As such, expansion of branches along with growth in credit and deposits indicate continued financial deepening. In reality, proactive technological deepening and flexible human resource management helped Indian banks to achieve such significant competitiveness and productivity gains.

1.3 Overview of Chapters

In this backdrop, present thesis approaches the 'who comes first' debate of 'finance-growth' nexus by considering the interrelation between financial development and economic growth through Chapter 2 and Chapter 3. To do so, we have followed the time series approach suggested by Arestis and Demetriades (1997) in a vector autoregressive (VAR) framework. In Chapter 4, we introduce income inequality to answer the question of who has benefitted from such growth. For this purpose, we resort to panel framework suggested by Christopoulos and Tsionas (2004). Considering the 13 major states in India we have utilised the panel vector autoregression (PVAR) approach proposed by Holtz–Eakin et al. (1988) in order to check how the joint dynamics of financial development and economic growth has contributed in impacting the overall income inequality of the major states.

The importance of development of financial sector in the growth story of India has been explored by different scholars over time. Attempts have also been made in understanding the direction of benefits of it as well (discussed at greater length in respective chapters). However, we identified 'three' research questions that remain unexplored and therefore, have undertaken an attempt to answer them through the next few chapters. From this perspective, present thesis is a unique attempt to the burgeoning literatures surrounding the country–based evidence of 'finance–growth' nexus. Therefore, each of our 'three' chapters are unique in their contribution, investigation and exploration of the 'three' questions that remained unattended for long.

Chapter 2 contributes its uniqueness by discussing how the interdependence between the financial and the real sector has evolved through the major phases of banking sector reforms. However, such a framework remains incomplete without the consideration of other variables. As such, we have considered the gross capital formation (investment) by the public and private sectors into our framework as well. By doing so, we offer an alternative framework to investigate the 'finance–growth' nexus for developing economies. The dynamics of this relationship has been studied by considering the periods covering – (i) post-republic 1951 till nationalisation in 1969, (ii) between nationalisation in 1969 and liberalisation in 1991 and (iii) post–liberalisation years from 1991 till 2017. Applying the VAR methodology in a time–series framework, this chapter studied the data on Indian economy from 1951–2017 and uses impulse response of the variables in understanding the effect. It finds evidence to favour the 'Schumpeterian view' that growth follows finance and observes that 'nationalisation' has negative impact on growth while 'liberalisation' has impacted it positively.

Chapter 3 attempts to answer another question – what is the mechanism through which financial sector influences the real output at an aggregate level. It explores whether financial sector plays any role in explaining the dynamics of the inter–sectoral linkages or not. Applying the time–series techniques of structural vector autoregression (structural–VAR), it observes that in case of India (during the period from 1972–2019), growth of banking–finance in the form of sectoral credit allocation has provided a positive impact on real growth of that sector and others. This could be viewed as a channel through which 'finance–growth' nexus materialises itself at an aggregate level of the economy. The transmission initially begins from the credit allocation of the different sectors which in due course, increases their level of output and gets aggregated into the final output of the economy. At the same time, credit allocated to a sector impacts its own output directly and that of the other sectors indirectly. This refers to the role of the financial intermediation in explaining the inter–sectoral linkage of an economy. Thus, financial sector claims more relevance for the Indian economy. Besides, the impulse responses observe that there is a 'less–than desired' impact of the banking credit allocated for industrial sector. Such an observation is aligned with the reality as well. However, the impact of the bank credit on output growth of the agriculture and sub–sector of service (trade and transport), as observed, are positive.

Finally, in Chapter 4 another distinct attempt has been made to investigate the role of such 'interdependence' between the financial sector and economic growth in impacting the income inequality across the major Indian states. For this purpose, state–level Gini coefficients for the period of 1990–2012 have been computed following the methodology of Beta Lorenz curve suggested in Datt and Ravallion (1992). The uniqueness of this chapter lies in – (i) investigation of finance–growth–inequality at the state level in context of India, (ii) application of Datt-Ravallion methodology, in finance-growth study for the very first time and (iii) construction of an environment by combining growth and ‘trickle–down’ (through per–capita income), level of government initiative (through development expenditure of the state government) and size and access to formal banking (through financial depth). To such an environment, the usual techniques of panel vector autoregression (PVAR) has been applied and evidence has been observed in favour of the ‘Robinsonian view’ that finance follows growth. In other words, we observe that during the liberalisation and post-liberalisation years, financial development followed economic growth for the major states in India. Besides, it is also observed that formal financial intermediation has helped in reducing the income inequality to some extent while economic growth has aggravated it. Our empirical evidence also shows that financial depth helps in explaining the developmental expenditure incurred by the state governments. This indicates that financial sector has helped in channelising the developmental expenditure to the reach of remote areas, poors and disadvantaged ones of these states.

With this introduction, we organise the thesis as follows – Chapter 2 discusses the ‘finance–growth’ nexus during the post–republic years from 1951–2017, Chapter 3 explores the role of bank credit in explaining sectoral growth and interlinkages in India during the post–nationalisation era of 1972–2019, Chapter 4 delves into the impacts of this ‘nexus’ on income–inequality of the major Indian states during the liberalisation and post–liberalisation years of 1990–2012 and Chapter 5 concludes by providing a summary of main contributions of the thesis and scope for further research.

Chapter – 2

The Nexus: Major Phases of Banking in India

2.1 Introduction

The age–long debate between the 'Schumpeterian view' and the 'Robinsonian view' over the significance of financial sector in determining the growth of an economy, has resulted into burgeoning scholarly work. Economists from time to time have tried to collect evidence in favour of one view or the other, either by studying a group of nations or a particular nation or regions within a nation. From this perspective, present chapter is a country–specific study of India and attempts to collect evidence in favour of the same. Besides, amongst the variants of financial sector, it limits itself to the impact of the financial intermediation (banking) only.

Interestingly, there also exists a serious debate over the most applicable econometric methodology in unveiling the insights about the 'finance–growth' interrelationship. From an empirical perspective, King and Levine (1993) would always be considered as a bench–mark. However, the cross–country methodology pursued by them was highly criticised in Arestis and Demetriades (1997) who established that the 'time–series' methodology imparts more insight into such relationship than others. Although Christopoulos and Tsionas (2004) resorts to panel context in order to increase the sample size for their study, however, time–series framework remains the most popular convention till date and present chapter does not deviate from that.

Bidirectional causality between financial development and economic growth in India has been confirmed in pioneering studies like – Greenwood and Jovanovic (1990), Demetriades and Luintel (1996) and Singh (2008) amongst others. Chakraborty (2010) extends the Mankiw et al. (1992) model to explore the same and observes that unlike other emerging economies, stock markets are no substitutes for the banking sector in India. Granger causality test in Pradhan (2010) figures bidirectional causality between money supply and economic growth and between bank credit and economic growth amongst other observations. However, Kar and Mandal (2014) argues that such studies does not adequately address the relative significance of banks and stock markets in 'finance-growth' relationship. On the other hand, Singh and Mishra (2014) in their attempt to study how financial development reduces market frictions via transaction and information cost finds evidence favouring 'Robinsonian view'. Therefore, finance does not induce growth but responds to the changing demands of the real sector. In a penetrative study, Das and Guha–Khasnobis (2008) attributes this ambiguity of consensus to the inadequate specification of the transmission mechanism in econometric literature. They observe that in presence of credit rationing by banks, transmission mechanism between real and financial sector, nowadays, operates through the allocation of credit and not interest rate.

However, none of these studies have paid adequate focus to the major phases of the banking sector reforms in India. As such, present chapter is the very first attempt that considers the two major break–points associated with financial intermediation in India – (1) 1969 (Nationalisation of the Banking Sector in India) and (2) 1991 (Liberalisation of the Indian Economy) in exploring the nexus. Assuming that investment plays a significant role in explaining the economic growth and banking sector helps in generating such investments, present chapter includes both private and public sector investments with real per capita GDP and financial depth (ratio of deposit to lagged GDP) to study the finance–growth interlinkage in India. In this spirit also, present chapter is unique because the general consensus of India–based studies have been in considering either inflation (Dal Colle, 2011), income–inequality (Ang, 2010), interest rates (Chakraborty, 2010), secondary market (Kar & Mandal, 2014), trade openness (Fukuda, 2018) etc. as the framework for investigating the finance–growth linkage.

Deriving from Chapter 1 (Section 1.2), post–independence India (period after 1947) with her initial economic backwardness qualifies as an interesting case where both public and private investments would be significant as well as an important mechanism in promoting economic growth. As such, India's financial sector development and its upgradation through reforms could be understood as an improvement in feeding the investment requirements by channelising the necessary funds. This signifies the importance of investments (present chapter only considers two forms of it – public and private) as well as the significance of financial intermediation in understanding the nexus of 'finance–growth' for India.

With the above intuition, present chapter derives motivation from King and Levine (1993) and proceeds following the suggestions of Arestis and Demetriades (1997). Therefore, it considers 'time–series' framework for extracting the insights about the finance–growth nexus in India during the major phases of banking sector reforms.

The subsequent sections approaches as follows – Section 2.2 discusses the econometric model and the estimation procedure undertaken in this chapter, Section 2.3 discusses the data collection and the summary statistics. Empirical results have been discussed in Section 2.4 and Section 2.5 concludes the chapter.

2.2 Econometric Model

To follow a time–series framework, we assume that the growth in real sector depends, over time, on financial intermediation and the channels of public and private investments. Based upon the discussion in Section 2.1, the time–series relationship between the variables at any time–point t [1951 to 2017], could be denoted by a linear vector autoregression (VAR) framework. In our case, the reduced–form linear VAR model with m lags (to be determined via estimation) and $k(=4)$ endogenous variables, as introduced by Sims (1980), could be expressed as –

$$\begin{bmatrix} LY_t \\ FD_t \\ PR_t \\ PB_t \end{bmatrix} = \begin{bmatrix} \mu_{LY} \\ \mu_{FD} \\ \mu_{PR} \\ \mu_{PB} \end{bmatrix} + \sum_{j=1}^{m} A_j \begin{bmatrix} LY_{t-j} \\ FD_{t-j} \\ PR_{t-j} \\ PB_{t-j} \end{bmatrix} + \begin{bmatrix} e_t^{LY} \\ e_t^{FD} \\ e_t^{PR} \\ e_t^{PB} \end{bmatrix} \cdots\cdots\cdots\cdots (1)$$

Here, $y = [LY_t, FD_t, PR_t, PB_t]'$ is the $(k \times 1)$ matrix of endogenous variables, $\mu = [\mu_k]$ is the (4×1) matrix of intercepts, A_j is the (4×4) matrix of coefficients for j^{th} lag and $e = \left[e_t^k\right]$ represents the (4×1) matrix of Gaussian residuals. Equation (1), however, is subjected to modification under the presence of variables integrated of order one, $\mathrm{I}(1)$ i.e., non–stationary.

We define, $FD_t = \frac{DEP_t}{Y_{t-1}}$; $PR_t = \frac{PRIVINV_t}{Y_t}$; $PB_t = \frac{PUBINV_t}{Y_t}$.

DEP_t = Aggregate deposits in real terms at period t.

$PRIVINV_t$ = Real gross fixed capital formation (GFCF) by private sector at period t.

$PUBINV_t =$ Real gross fixed capital formation (GFCF) by public sector at period t.

$Y_t =$ Real GDP at period t.

$y_t =$ Real per–capita GDP at period t.

$LY_t =$ Natural logarithm of y_t, $ln(y_t)$

$FD_t =$ Depth of the financial sector at period t.

FD_t is the standard measure of financial depth in finance–growth literature and an indicator of the financial development (King & Levine, 1993). GFCF refers to the gross additions to fixed assets and is a standard measure of investment in national income accounts. Present chapter considers only the capital formation via construction and machinery equipment made by the public sector while private sector is composed of private corporate and household sector. Finally, logarithm of per–capita GDP is the aggregate measure of the real part of the economy.

From an econometric perspective, consideration of one–period lagged deposit finds justification in removing the endogeneity problem. However, consideration of current period ratios in case of private and public investment implies that a part of country's output is not consumed but utilised for investment. As such, we expect them to have lagged impact on economy because immediate realisation of investment for real sector growth would be unrealistic in nature. Therefore, we are interested in capturing the impact and interaction of FD_t, PR_t and PB_t with the log of per-capita income, LY_t.

Our approach has two purposes – (i) nature of relationship amongst the variables and (ii) the impact of change in one variables on the other variables.

Purpose I : Nature of the relationship among the variables

A visual inspection of Figure 2.1 (Section 2.4) reveals that each series has a changing mean with fluctuating variance, indicating non–stationarity. As testing procedure, we begin with the testing of non–stationarity by applying the standard unit root tests – augmented Dickey–Fuller (ADF) test due to Said and Dickey (1984), Phillips–Perron (PP) test due to Phillips and Perron (1988) and Dickey–Fuller generalised least square (DF–GLS) test due to Elliot et al. (1996) to test the null of unit root against no unit root. Our results are cross–validated by KPSS test due to Kwiatkowski et al. (1992) which tests the null of no unit root against the unit root alternative. Existence of unit–root in each of the variables has been confirmed by all tests.

However, under the presence of structural break, such tests are generally biased towards their unit–root null. Therefore, we conducted the Bai and Perron (1998) multiple break point test to detect the number of breaks. Banerjee, Lumsdaine and Stock (1992) or BLS test has been applied, thereafter, to test the presence of unit–root irrespective of break. BLS confirms that the series are non–stationary irrespective of breaks. Consistent with the econometric theory, these variables have to be cointegrated for any meaningful relation (Engle & Granger, 1987) to exist. Further, every cointegration relation must be accompanied with an error–correction term (ECT) as well. Under any short–run deviation from long–run equilibrium, coefficient of ECT will determine the speed of adjustment back to the equilibrium.

In our case, the optimal lag–length selected by Schwartz Bayesian Information Criteria (SBIC) and Hannan–Quinn Information Criteria (HQIC) is one while that selected by Akaike Information Criteria (AIC) is two. Owing to Lütkepohl (2005), we choose to remain with one lag because minimising SBIC and HQIC has theoretical advantage over AIC in terms of providing consistent estimate of the true lag order while minimising AIC could overestimate the true lag order with positive probability. Finally, Johansen (1988) cointegration test shows that there is one cointegration relation among our system variables.

Therefore, our VECM is composed of one cointegration relation, two dummies (NAT and LIB) and one lag. Usually, a VECM of k endogenous variables contained in a (4×1) matrix with z exogenous variable and having p lags ($p = 1$) could be compactly expressed as –

$$\begin{bmatrix} \Delta LY_t \\ \Delta FD_t \\ \Delta PR_t \\ \Delta PB_t \end{bmatrix} = \begin{bmatrix} \mu_{LY} \\ \mu_{FD} \\ \mu_{PR} \\ \mu_{PB} \end{bmatrix} + \begin{bmatrix} \alpha_{LY} \\ \alpha_{FD} \\ \alpha_{PR} \\ \alpha_{PB} \end{bmatrix} ECT_{t-1} + \begin{bmatrix} \gamma_{LY} & \delta_{LY} \\ \gamma_{FD} & \delta_{FD} \\ \gamma_{PR} & \delta_{PR} \\ \gamma_{PB} & \delta_{PB} \end{bmatrix} \begin{bmatrix} NAT \\ LIB \end{bmatrix} + \begin{bmatrix} e_t^{LY} \\ e_t^{FD} \\ e_t^{PR} \\ e_t^{PB} \end{bmatrix} \cdots\cdots\cdots (2)$$

Here, $z = [NAT, LIB]'$, $ECT_{t-1} = LY_{t-1} - \theta FD_{t-1} - \psi PR_{t-1} - \varphi PB_{t-1}$ is the error–correction term (or cointegration equation) normalised with respect to LY_{t-1} and represents deviation from long–run equilibrium in previous period, $\alpha = [\alpha_k]$ is the (4×1) coefficient of ECT term while θ, ψ and φ are the coefficient estimates of the variables entering the ECT equation. Finally, $\mu = [\mu_k]$ and $e = [e_t^k]$ matrices have same meaning as before. The ECT has been obtained through a model of the following form –

$$\begin{bmatrix} \Delta LY_t \\ \Delta FD_t \\ \Delta PR_t \\ \Delta PB_t \end{bmatrix} = \begin{bmatrix} \mu_{LY} \\ \mu_{FD} \\ \mu_{PR} \\ \mu_{PB} \end{bmatrix} + \Pi \begin{bmatrix} \Delta LY_{t-1} \\ \Delta FD_{t-1} \\ \Delta PR_{t-1} \\ \Delta PB_{t-1} \end{bmatrix} + \begin{bmatrix} e_t^{LY} \\ e_t^{FD} \\ e_t^{PR} \\ e_t^{PB} \end{bmatrix} \cdots\cdots\cdots\cdots (3)$$

where, $\mu = [\mu_k]$ and $e = [e_t^k]$ matrices have same specification as before. The (4×4) matrix, Π whose rank, r denotes the number of cointegration relation among the variables could be decomposed as $\Pi = \alpha\beta'$ where α denotes the speed of adjustment and β is the matrix of cointegrating vectors.

Finally, both the trace and maximum eigen–value test due to Johansen (1988) cointegration test have been performed and one cointegration relation has been identified among the variables.

Purpose II : Impact of a change in one variable on others

For this purpose, we obtained the impulse response functions (IRFs) of the VECM discussed previously. Further, in order to capture the impacts of ‘Bank Nationalisation in 1969’ and ‘Liberalisation in 1991’, we have constructed two time dummies – *NAT* and *LIB* defined as –

(1) NAT (1 for years 1969 and 0 otherwise) and (2) LIB (1 for years 1991 and 0 otherwise) and treated them as exogenous to our VECM.

However, in context of IRFs and orthogonalised IRFs (OIRFs), it should be noted that unlike VAR or structural VAR (SVAR), the effect of innovations might not die out in case of integrated and cointegrated variables. In other words, the IRFs and OIRFs might not taper off to zero. If they do then the effect of such innovation is temporary, else permanent which is more common

(Lütkepohl, 2005, pp. 237–268) in case of non–stationary variables.

Construction of VECM suffices the twin purposes of capturing the long–run movement through ECT and short–run dynamics through the coefficient estimates. In present case, short–run dynamics of the parameter estimates could not be obtained due to insufficiency of the lag–order. The present model has also been tested with lag order greater than one ($p = 2,3$). Such specification did allow us incorporating lagged values of the system variables but at the cost of the stability of the VECM.

Therefore, we choose to proceed with the specification at lag order one and keep ourselves constrained to the long–run implications only. We do not consider that our series to begin at zero and therefore, intercept terms have been included. Finally, IRFs would tell us whether an unexpected change in one–variable would have a permanent or temporary effect.

2.3 Data

All data have been collected combining the various publications of *National Accounts Statistics (NAS)* published by Ministry of Statistics and Programme Implementation (MOSPI), Government of India (GOI) and *Database on Indian Economy (DBIE)* published by Reserve Bank of India (RBI). Data on variables – gross fixed capital formation (GFCF) by public and private sector, gross domestic product (GDP) and Wholesale Price Index (WPI) have been collected from *NAS*, MOSPI and data on banking deposits have been collected from *DBIE*, RBI. Splicing method has been applied to the WPI in order to obtain its corresponding 2011–12 equivalents. Therefore, results of our chapter are free from fluctuations caused by the inflationary effects.

Table 2.1: Descriptive statistics of the variables

Variables	Obs.	Mean	SD	Median	Maximum	Minimum
LY	70	8.0019621	0.5932723	7.8068942	9.2932544	7.23271728
FD	69	0.3347954	0.2471924	0.2757758	0.8477104	0.06714281
PR	69	0.6363476	0.1028211	0.6226267	0.7916843	0.45239738
PB	69	0.0258184	0.0264491	0.0171981	0.0798253	0.00059632

Source: Author's calculation. Here, LY = natural logarithm of per–capita GDP, FD = ratio of banking deposits to one–period lag in GDP, PR = ratio of real fixed capital formation in private sector to GDP, PB = ratio of real fixed capital formation in public sector to GDP; Obs. = total observation; SD = standard deviation.

2.4 Results and Discussion

All estimations have been carried out using STATA version 14. To investigate the impact of the major phases of banking reforms, our entire observation period has been segmented into three parts – pre–nationalisation (Phase I), nationalisation to liberalisation (Phase II) and post–liberalisation (Phase III) periods.

As far as private and public investments in terms of fixed capital formation are concerned, Figure 2.1 reflects that the periods during which one goes down, the other has risen and vice–versa. However, in years following 2004, this trend has taken a shift and both have increased simultaneously. Indeed the performance of private sector investment during Phase I and Phase II have lots of fluctuations in it. However, this matches the general view that private sector investment has never been much impressive in post–independent India until recently.

All the unit root tests (Table 2.2 and 2.3) identify that all four variables are integrated of order one, i.e. I(1). Besides, our Bai–Perron multiple break point test (Table 2.4) confirms the existence of several breaks in each of this series and therefore, unit–root identification requires application of the BLS test of null of unit–root under rolling and recursive technique against the stationary alternative. From Table 2.5, BLS test confirms that all of our series contain unit–root independent of the structural breaks because we are unable to reject the unit–root null. With such confirmation, we proceed for the Johansen (1988) test of cointegration.

Cointegration test is sensitive to lag length. In our case, the lag selected by the standard SBIC and HQIC of one has been utilised throughout. At lag one, cointegration test using both trace and maximum eigen value have been carried out. The test results in Table 2.6, unanimously point to the same conclusion of existence of one cointegrating relations among the variables at 5 percent level of significance by rejecting the null of no cointegration.

On basis of the cointegration test, all we could say is that the past values of one variable do not improve upon the values of others in short–run. Also, some of the adjustment parameters are not significantly different from zero, however, all variables are responding to the long–run deviation with signs as expected (negative for ΔLY_t and ΔPB_t and positive for ΔPR_t and ΔFD_t).

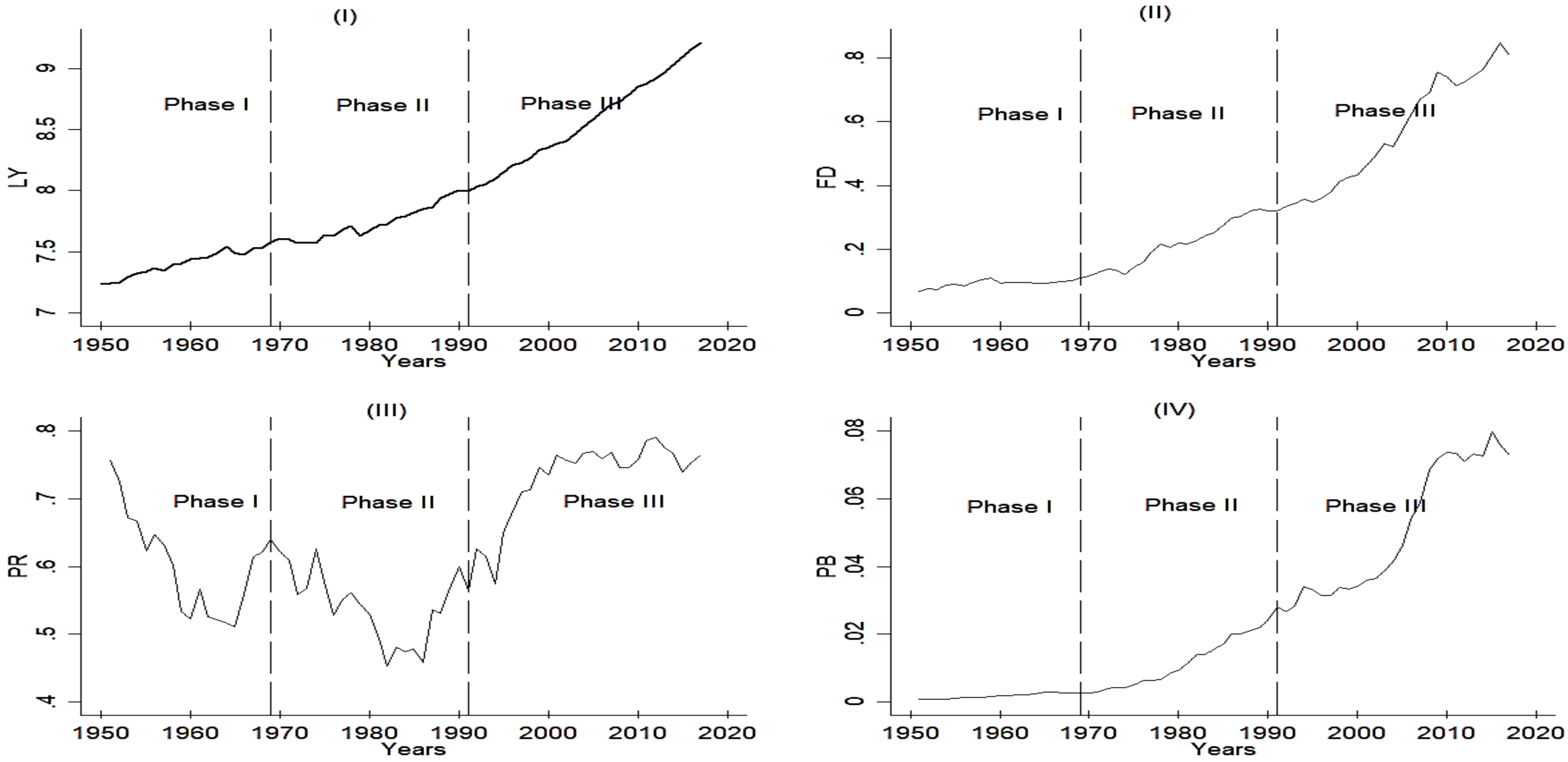
This implies that to any deviation from the long–run equilibrium, ΔLY_t and ΔPB_t respond negatively while ΔPR_t and ΔFD_t respond positively. The residuals, however, pass the post–estimation tests of no autocorrelation at the selected lag. With respect to normality, our residuals pass the Jarque–Berra test of normality as well. The most exciting implication, however, lies in the estimates of NAT and LIB (our time dummies to capture the impact of 'nationalisation' and 'liberalisation' on the system variables respectively).

We observe in Table 2.8 that every sector has benefitted from 'liberalisation' except the public gross fixed capital formation (PB_t). This is quiet natural because the liberalisation in 1991 came hand in hand with 'privatisation' and government did withdraw from investing into various undertakings. LIB has helped improve the performance of financial sector (FD_t) as well. The impacts, however, are significant for private sector investment via fixed capital formation (PR_t) while real sector (LY_t) enjoyed the maximum benefit. Thus economic growth did benefit from the withdrawal of government intervention via liberalisation.

As far as the period of nationalisation (Phase II) is concerned, there were enough restrictions and interventions from the government sector on financial sector which were actually hurting the economic growth. We know, that during this period, there were different rates of interest applicable for different types of loans, by and large, administered regulatory requirement of maintaining the fixed capital adequacy and governmental obligation of expanding the priority sector lending. Under such circumstances, banks ended up ignoring the quality of the loans and finally ended up with several bad loans. As a result, there were increase in non–performing assets (NPAs) of the banks (History of RBI, various volumes). Therefore, private investment could not thrive as desired which called for government or public spending to supplement the same in promoting growth. Our NAT estimate with negative coefficient for LY_t is an alternative expression of it.

The second purpose of this chapter lies in deciphering what happens to our system of four variables. This could be identified from the impulse responses and the forecast error variance decomposition of the VECM. However, impulses obtained from VECM do not necessarily taper off to zero (as in Figure 2.2). If they do, then the shocks are temporary, else permanent.

Figure 2.1: Key variables during the Major Phases – I, II and III



Source: Computed from NAS, MOSPI and DBIE, RBI data. Here,: LY = Natural logarithm of per–capita GDP, FD = Ratio of bank deposits to one–period lag in GDP, PR = Ratio of real fixed capital formation in private sector to GDP , PB = Ratio of real fixed capital formation in public sector to GDP.

Table 2.2: Result of unit–root tests (at level)

	ADF Test Results			PP Test Results			DF–GLS Test Results			KPSS Test Results		
Series	**Test Result**	**Critical Values (at 1% & 5%)**	**Nature of Test**	**Test Result**	**Critical Values (at 1% & 5%)**	**Nature of Test**	**Test Result**	**Critical Values (at 1% & 5%)**	**Nature of Test**	**Test Result**	**Critical Values (at 1% & 5%)**	**Nature of Test**
LY	0.914	(–4.106)	Int, T,	1.512	(–4.103)	Int, T,	0.265	(–3.713)	Int, T,	0.830 **	(0.216)	Int, T, L=1
FD	–1.356	(–3.480)	L=1	–1.160	(–3.479)	L=1	–0.933	(–3.142)	L=1	0.749 **	(0.146)	
PR	–1.718			–2.068			–1.230			0.707 **		
PB	–2.912			–2.687			–1.654			0.482 **		

*Source: Author's calculation. Here, ***, **, * corresponds to rejection of null hypothesis at significance level of 1%, 5% and 10% respectively.*

Int = Intercept, T = Time trend, L = No. of lags for the first difference of the variables in test equation.

Table 2.3: Result of unit–root tests (at first difference)

	ADF Test Results			PP Test Results			DF–GLS Test Results			KPSS Test Results		
Series	**Test Result**	**Critical Values (at 1% & 5%)**	**Nature of Test**	**Test Result**	**Critical Values (at 1% & 5%)**	**Nature of Test**	**Test Result**	**Critical Values (at 1% & 5%)**	**Nature of Test**	**Test Result**	**Critical Values (at 1% & 5%)**	**Nature of Test**
ΔLY	–6.796**	(–4.108)	Int, T,	–9.397**	(–4.106)	Int, T,	–6.905**	(–3.717)	Int, T,	0.105	(0.216)	Int, T, L=1
ΔFD	–5.260**	(–3.482)	L=1	–6.445**	(–3.480)	L=1	–4.612**	(–3.145)	L=1	0.048	(0.146)	
ΔPR	–6.059**			–9.140**			–5.242**			0.064		
ΔPB	–6.525**			–7.159**			–6.597**			0.097		

*Source: Author's calculation. Here, ***, **, * corresponds to rejection of null hypothesis at significance level of 1%, 5% and 10% respectively.*

Int = intercept, T = time trend, L = number. of lags for the first difference of the variables in test equation..

Table 2.4: Result of Bai–Perron multiple breakpoint test

Series (at Levels)	**Estimated Breaks**	**Break Dates**	**Major Events**
LY	5	1960, 1976, 1987, 1997, 2007	1960 : Technological boom due to 2^{nd} FYP. 1975–76 : Political instability at Centre, High inflation and upsurge in money supply coupled with first ever increasing manufacturing output. 1986–87 : Severe drought with decline in agriculture and industrial production.. 1987 : Stock Market Crash (The Black Monday). 1994–96 : Sound behaviour of the macroeconomic variables amidst political dilemma at the Centre, Change in Foreign policy, Change in Government. 1997 : East Asian Financial Crisis, slowing down of the real GDP.. 2004–07 : Shift in Political Colour, Remained period of high growth for India.
FD	5	1960, 1976, 1987, 1997, 2005	
PR	3	1986, 1996, 2006	
PB	4	1960, 1975, 1994, 2005	

Source: Author's calculation

Table 2.5: Result of BLS unit–root test

		Recursive Test Results		Rolling Test Results		ADF Test Results
Series		$\hat{t}_{DF}^{max}$	$\hat{t}_{DF}^{min}$	$\hat{t}_{DF}^{max}$	$\hat{t}_{DF}^{min}$	t_{DF}
LY		–0.73	–6.89**	–0.67	–4.89	0.91
FD		0.48	–3.000	0.89	–2.59	–1.36
PR		–0.88	–4.41***	–1.07	–4.75	–1.72
PB		–0.14	–3.99	–0.25	–4.24	–2.91
Critical Values	5%	–2.21	–4.62	–1.66	–5.29	–3.73
	1%	–1.99	–4.33	–1.49	–5.01	–3.45

*Source: Author's calculation. Here, ***, **, * corresponds to rejection of null hypothesis at the significance level of 1%, 5% and 10% respectively.*

Also, BLS = Banerjee–Lumsdaine–Stock test.

Table 2.6: Result of Johansen cointegration test

Maximum Eigen–value Test				Trace Test			
Null	**Alternative hypothesis**	**Calculated Value**	**Critical Value at 5%**	**Null**	**Alternative hypothesis**	**Calculated Value**	**Critical Value at 5%**
$r = 0$**	$r = 1$	28.7291**	27.07	$r \leq 0$**	$r > 0$	58.1674**	47.21
$r = 1$	$r = 2$	14.9596	20.97	$r \leq 1$	$r > 1$	29.4383	29.68
$r = 2$	$r = 3$	9.8038	14.07	$r \leq 2$	$r > 2$	14.4787	15.41
$r = 3$**	$r = 4$	4.6749	3.76	$r \leq 3$**	$r > 3$	4.6749	3.76

*Source: Author's calculation. Here, ***, **, * corresponds to rejection of null hypothesis at significance level of 1%, 5% and 10% respectively; r = number. of cointegration vectors; eigen values (0.40196, 0.20089, 0.11682, 0.07895)*

Table 2.7: Cointegration vector

LY_t	FD_t	PR_t	PB_t	Constant
1.0000	–6.7396** (1.2145)	–0.3593 (0.5301)	39.3032** (11.1631)	–6.8843

*Source: Author's calculation. Standard error in parentheses. Here, ***, **, * corresponds to rejection of null hypothesis at significance level of 1%, 5% and 10% respectively.*

Table 2.8: Result of error–correction estimates

	Dependant Variables			
Explanatory Variable	ΔLY_t	ΔFD_t	ΔPR_t	ΔPB_t
ECT_{t-1}	–1.1200 (0.8251)	0.2366 (0.5644)	1.980** (0.9678)	–0.2182** (0.0643)
NAT	–0.0028 (0.0086)	0.0076 (0.0059)	0.0085 (0.0101)	0.00045 (0.0007)
LIB	0.0262** (0.0075)	0.0077 (0.0051)	0.0127 (0.0088)	0.0003 (0.0006)
μ_t	0.0116 (0.0080)	0.0039 (0.0055)	0.0059 (0.0094)	–0.0013** (0.0007)
R^2	0.6326	0.3326	0.0957	0.3784

*Source: Author's calculation. Standard Error in parentheses. Here, ***, **, * corresponds to rejection of null hypothesis at significance level of 1%, 5% and 10% respectively.*

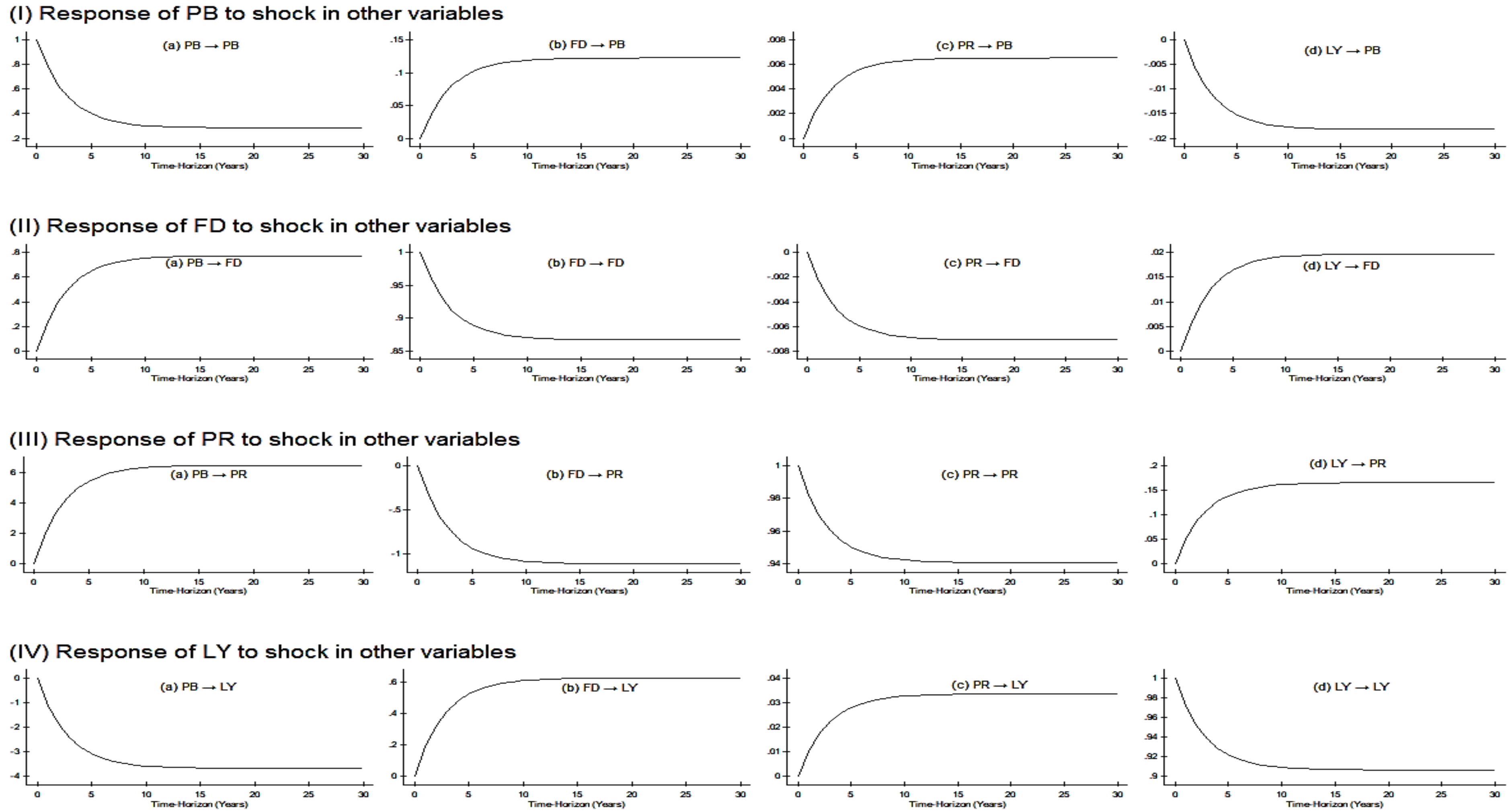
As we could see from Figure 2.2, all of the adjustments take place within a 10 years period implying existence of a long run permanent relationship amongst the variables. A one percent change in FD_t and PR_t causes an asymptotically increasing impact while that of PB_t causes an asymptotically decreasing impact to the real sector growth, LY_t. For FD_t, a one percent change in real sector output and public sector investment via fixed capital formation has a positive impact. In a way, we could say that financial sector encourages deposits via policy measures. Therefore, a decreasing effect, however, positive could be observed in response of FD_t to a PR_t shock and vice–versa.

For private and public investment, we could observe that they have positive permanent impact on each other. Thus at a particular time–period, public sector encourages private participation. However, if we look at the responses then it would be evident that shock to PB_t has more positive ramification on PR_t. Finally, in case of real–sector, we could observe that output responds positively to a FD_t and PR_t shock implying that financial sector and private sector investment has positive impact on it. However, public sector investment (as per Figure 2.2) leaves a discouraging impact on the overall growth of the economy.

Table 2.9 captures the decomposition of variation in forecast error amongst the variables at horizons of 1–30 years. To obtain the decomposition, we allowed the shocks to systematically enter the system in an ordered manner such that at any time period, the growth process begins with the government sector first and then follows the financial sector, private sector and finally manifests in economic growth, i.e., $PB_t \rightarrow FD_t \rightarrow PR_t \rightarrow LY_t$.

It could be observed that every sector has preponderance in explaining its own shock which diminishes gradually as we move ahead with the horizon. The importance of the financial sector

Figure 2.2 : Impulse response analysis of the key variables



Source: Author's calculation. Impulse responses computed on basis of Monte Carlo simulation using 200 replications for 30 periods.

Table 2.9: Result of FEVD of the key variables

Shocks		Impact Horizon (in Years) Ahead						
Response	**Impulse**	**1**	**5**	**10**	**15**	**20**	**25**	**30**
PB_t	PB_t	1.0000	7.5471	5.6742	4.9260	4.5601	4.3493	4.2121
	FD_t	1.5467	1.8211	1.9754	2.0484	2.0873	2.1111	2.1284
	PR_t	1.0201	0.5572	0.365	0.2923	0.2554	0.2345	0.2201
	LY_t	0.1712	0.2401	0.3122	0.3424	0.3583	0.3684	0.3742
FD_t	PB_t	0.0000	2.3101	4.0734	4.7783	5.1222	5.3212	5.4489
	FD_t	8.4534	8.1774	8.0201	7.9461	7.8812	7.8761	7.8652
	PR_t	0.0088	1.3111	2.1590	2.5262	2.7151	2.8264	2.8991
	LY_t	0.8584	2.0291	2.6731	2.9474	3.0891	3.1732	3.2284
PR_t	PB_t	0.0000	0.0010	0.0017	0.0020	0.0021	0.0022	0.0023
	FD_t	0.0000	0.0016	0.0034	0.0043	0.0048	0.0051	0.0053
	PR_t	8.8921	8.0864	7.3914	7.0791	6.9181	6.8233	6.7612
	LY_t	0.2049	0.2049	0.2196	0.2228	0.2237	0.2241	0.2243
LY_t	PB_t	0.0000	0.1344	0.2364	0.2756	0.2961	0.3083	0.3151
	FD_t	0.0000	0.0221	0.0459	0.0584	0.0654	0.0697	0.0726
	PR_t	0.0000	0.0046	0.0085	0.1021	0.1152	0.1172	1.201
	LY_t	8.8294	7.5111	6.7924	6.4861	6.3294	6.2353	6.1722

Source: Author's calculation. FEVD computed on basis of Monte Carlo simulation using 200 replications for 30 periods could invariably be observed in our system. For each of the other sector, financial sector contributes more in explaining the variance in forecast error. From only 23 percent and 20 percent at shorter horizon (4–5 years) for public investment and real sector respectively, it could explain more than 50 percent and 30 percent for those sectors at a longer horizon (20 years). This indicates the long term dependency and effectiveness of economic growth on finance. However, almost all of the financial sector variation at longer horizon is attributable to itself and public sector.

A similar implication could be observed for the private sector as well. At shorter horizon (4–5 years) only 13 percent is attributable to financial sector whereas at longer horizon (20 years) the same increases to 29 percent. There exist importance of public and private sector for the real sector as well. Initially, the contribution of private sector dominates but at a longer horizon the implication of the public sector could not be ignored. From 1.71 percent initially, public sector gradually picks up to 3 percent at a horizon of 10 years and to almost 4 percent at 30 years horizon. In doing so it surpasses the initial dominance of private sector (2 percent initially to almost 2.3 percent at 10 years and 2.5 percent at 30 years horizon). The real sector, however, has a unidirectional long term dependency on financial sector.

2.5 Conclusion

In country–specific empirical literature concerning ‘finance–growth’ relationship, two of the most debated propositions are – (i) financial deepening has strong impact on the growth process and (ii) measures of financial activity rather than size of the sector plays more significant role in the growth process. In present chapter, an attempt has been made to re–examine the validity of those propositions. Besides, there is a general consensus that such relationship is governed by plethora of other factors. Therefore, present chapter has attempted to develop the nexus in an environment of private sector and public sector investments via gross fixed capital formation as well. In doing so, we have obtained strong evidence in favour of the ‘Schumpeterian view’ that a bank–based financial system induces long–term growth of the real sector.

With respect to the first proposition, present chapter finds that financial depth exerts a positive long–term influence on the output growth and therefore happens to be an extremely effective determinant in promoting growth in the long–run. However, such an impact is unidirectional from financial sector to growth. We find no evidence in favour of the reverse causality, i.e., from growth to financial sector. As such, our evidence support the' ‘Schumpeterian view’.

In examining the second proposition, we restricted the present chapter to only one activity of the financial sector – the banking intermediation and used financial depth as a measure of its size. We find evidence in favour of the fact that both activity and size matters in case of growth of the Indian economy. However, financial intermediaries do not directly take part into the growth process. Therefore, the private gross fixed investment could be viewed as the channels through which financial impact gets transmitted to the economy. Such investment is yet to be significant for the Indian economy and in long–run, public investment dominates.

Besides, existence of unidirectional long–term implication of the financial sector for real sector implies that there is no scope for a virtuous cycle of cumulative causation. We observe that the private sector investment has long–term implication as economic growth responds more positively to it than to the public sector investment. However, its performance is far from desired. By saying so, we imply that despite several structural changes, private sector investment is still largely dependent on public sector investment for influencing the economic growth. Its own influence on growth, although positive, is increasing only marginally.

Chapter – 3

Bank Credit and Sectoral Interlinkage: Post–Nationalisation Era

3.1 Introduction

In Chapter 2, we have witnessed the reasons favouring the importance of financial intermediation in causing real sector growth at an aggregate level of the economy. Considering this as a limitation, present chapter delves deeper into the economy and intends to examine the impact of financial intermediation and public investment at the sectoral level. Such an attempt of investigating 'finance-growth' nexus at a sectoral level is an area less explored in general and for Indian economy in particular.

In the years after the publication of Demetriades and Luintel (1996), several studies have attempted to explore and understand the direction of relationship between the financial intermediation or financial development and economic growth of the Indian economy. It has now been well established that financial intermediation has positive impact on the economic growth due to Demetriades and Luintel (1996) and later studies, like Singh (2008), Chakraborty (2010) and Pradhan (2010) amongst others. However, Kar and Mandal (2014) argues that existing studies could not capture the relative significance of banks and stock markets adequately while addressing the 'said' relationship and therefore, investigates the 'nexus' by incorporating the same. On the other hand, Singh and Mishra (2014) establishes that financial development simply follows the real sector growth. All these studies, however, have been conducted to explore the mechanism of the finance-growth relationship at an aggregate country–level. Thus, how the mechanism is manifesting at the sectoral level remains largely unexplored. As such, present chapter uniquely attempts to explore the mechanism of this relationship at the sectoral level and its implication in explaining the sectoral interlinkages.

Intervening 'finance–growth' nexus from the perspective of sectoral growth remained highly unexplored area of research until recently. Besides, approach varies among the studies based on impact of financial disbursement as well. While one approach varies from industrial output (Were et al., 2012) to private sector credit and total factor productivity (Arizala et al., 2013), the other approach concentrates either on financial sector reforms, mostly banking (Ekong, 2015) or on types of institutions – banking and non–banking (Cheng & Degryse, 2010).

Amongst the studies that explicitly investigated the linkage between institutional credit disbursement and output at the sectoral level, one of the pioneering study is Westermann (2012) in context of Nepal. It employed vector autoregression (VAR) approach for diagnosing the linkage. Ndubuisi (2017), on the other hand, adopts the approach of Granger causality and vector error correction (VECM) approach in exploring the impact of sectoral credit of commercial banks on Nigerian growth index. For Ethiopia, Tekilu et al. (2018) conducted a similar study by considering autoregressive distributive lag (ARDL) framework.

For India, Anwar (2015) observes that sectoral credit disbursement has positive impact on output of all the three (primary, secondary and tertiary) sectors. However, for agriculture, the study observes positive ramification from irrigation and cultivation. Further, Kaur et al. (2009) has also investigated the inter–sectoral linkage for the Indian economy. They find that there is a strong demand–side interdependence between the industry and service sector and between the agriculture and industry sector. In addition, they observe that the demand for service sector is more dependent on industry sector than on agriculture sector. In a similar study, Das and Guha–Khasnobis (2008) intervened the sectoral linkage to financial development considering the terms of loans. The sample period considered by them, however, matches the one considered in present chapter as well. They observe that both short–term and long–term credit have positive association with industrial output while only the former has positive association with agricultural output. Another important observation is that the nature of relationship between 'financial development and allocation of credit' or between 'output and allocation of credit' are different across the different sectors of the economy.

In existing literature, we have observed the existence of another line of reasoning and studies for the Indian economy as well. Despite having a long history of established stock markets (Das and Guha–Khasnobis 2008), various informational problems embedded into Indian economy (unlike other developed countries) remained inconducive to the development of a fully–fledged capital market as a source of finance. As such, it remained ineffective even after the independence (Mohan & Ray, 2017). The consequences were that of fragmentation, complementarity and repression (McKinnon, 1973; Shaw, 1973).

Evidence to such a problematic situation of the Indian financial sector was inherent in Hazari Committee Report of 1967 which paved the path for Banking Sector Nationalisation and the government control over the financial sector. Besides, Thornton and Poudyal (1990), Pal (2014) amongst others have tested the existence of McKinnon–Shaw hypothesis in case of India. in a similar line, Rajan and Zingales (1998) have studied the external finance model for India. Demetriades and Luintel (1996) and Luintel and Khan (1999) too have observed a bi–directional causality between the financial development and growth.

Indian economy has witnessed the 'Nationalisation of the Banking Sector' in 1969 – an event that defined the course of her financial sector in subsequent years. In terms of Reserve Bank of India (RBI), this approach to consolidate commercial banking, "… remains, without doubt, the single most important economic decision taken by any government since 1947. Not even the reforms of 1991 are comparable in their consequences — political, social and, of course, economic." (The Reserve Bank of India: Volume 3, 1967–81, pp. 13). According to Mohan and Ray (2017), "The decade of 1950s and 1960s was characterized by limited access to finance of the productive sector and a large number of banking failures. Such dissatisfaction led the government of left–leaning Prime Minister (and then Finance Minister) Mrs. Indira Gandhi to nationalize fourteen private sector banks on 20 July 1969; and later six more commercial banks in 1980." On the other hand, Indian Parliament looked upon it as an attempt "… in order to control the heights of the economy and to meet progressively, and serve better, the needs of development of the economy in conformity with national policy and objectives and for matters connected therewith or incidental thereto." (The Banking Companies Act, 1970). The dynamics of such an evolution in policies concerning the financial sector over the decades, in case of India, has been well documented in Jadhav (2006).

For the economy of India, 1950s and 1960s were characterised by absence of effective capital market. Due to which, a number of Developmental Financial Institutions (DFIs) came up through active government intervention to fill the gap of capital availability for the primary and secondary sectors of the economy. However, this does not imply absence of banking credit disbursement to those sectors. Rather, it implies that such credit (through banks) were inadequate enough to accomplish the desired growth in those sectors. In fact, Nationalisation of 1969 was undertaken in order to break that 'less–than adequate' performance of the sectoral credit flow from banks in order to facilitate faster growth.

Therefore, considering 1970 as the benchmark year, present chapter examines the impact of the growth in 'credit flow' from scheduled commercial banks (SCBs) and public sector investment in determining the growth and sectoral linkage of the primary, secondary and the tertiary sub–sector of the economy over the sample years of 1972–2019. Due to certain data limitation and observed inconsistencies, we could not consider all the sub–sectors of agriculture and especially of service. Since only trade and transport sectors have been considered for service, therefore, we would be calling it 'trade and transport sub–sector of service'.

An inherent problem in 'finance–growth' studies, in general, is the understanding of interest rate based credit flow while the true transmission mechanism in case of India at least has occurred from the credit allocation which at times resulted into credit rationing (Stiglitz & Weiss, 1981) as well. In this backdrop, present chapter contributes by examining how the growth in such sectoral credit allocation and public sector investment performed in influencing the growth in sectoral value addition and explaining their sectoral inter–linkage. This line of approach is very first in its attempt in context of India.

We organise the chapter in lines where Section 3.2 outlines the econometric model and the estimation procedure, Section 3.3 discusses the data and summary statistics, Section 3.4 discusses and interprets the results and Section 3.5 concludes.

3.2 Econometric Model

We assume government expenditure or public investment to play a crucial role in economic growth of an underdeveloped country like India. Thus, we model sectoral growth as dependent on growth in public investment and sectoral credit disbursement over–time. Our variables of interest are – gross value–added (GVA) by the sectors, credit disbursement ($CRED$) to the sectors from scheduled commercial banks and public sector investment (PI) for each sector. We denote our three sectors – agriculture, industry and trade and transport sub–sector of service as AG, IN and $TTSER$ respectively.

Therefore, at any time period t [1972(1)2019] and for $k \in (AG, IN, TTSER)$, we assume that the output of k^{th} sector depends on the amount of credit disbursement ($CRED$) and public sector investment (PI) to that sector. We consider that all our variables are endogenously determined and therefore, the relationship amongst them could be expressed using a linear vector autoregression framework. Since we have 'three' sectors and 'three' types of variables for each sector, therefore, there are 'nine' variables in total which defines the system for us.

To keep the discussion simple, we define a set Z that contains all of our 'nine' variables as –

$$Z = \{PB_t, SCB_t, SVA_t\} \dots\dots\dots\dots (1)$$

where, $PB_t = \{AGPB_t, INPB_t, TTSERPB_t\}$; $SCB_t = \{AGSCB_t, INSCB_t, TTSERSCB_t\}$ and $SVA_t = \{AGSVA_t, INSVA_t, TTSERSVA_t\}$. All our analysis will be restricted to the set y_t such that $y_t = Z'$.

The variables in Z have been defined as follows –

$SVA_{kt} = ln\left(GVA_t^k\right)$ = sectoral value added by the k^{th} sector at period t as the natural logarithm of gross value added (GVA) in sector k.

$PB_{kt} = \frac{PI_t^k}{GVA_t^k}$ = share of PI in GVA of the k^{th} sector at period t.

$SCB_{kt} = \frac{(Credit)_t^k}{GVA_t^k}$ = share of $CRED$ in GVA of the k^{th} sector at period t by SCBs.

Here, $k \in \{AG, IN, TTSER\}$. Therefore, we have 'nine' variables – 'three types' of variables for each of the 'three sectors' ($3 \times 3 = 9$).

With such specification, we could express a reduced–form linear VAR model with m lags (to be determined shortly) and $p(9)$ endogenous variables as introduced by Sims (1980) as –

$$\begin{bmatrix} AGPB_t \\ INPB_t \\ TTSERPB_t \\ AGSCB_t \\ INSCB_t \\ TTSERSCB_t \\ AGSVA_t \\ INSVA_t \\ TTSERSVA_t \end{bmatrix} = \begin{bmatrix} \mu_{AGPB} \\ \mu_{INPB} \\ \mu_{TTSERPB} \\ \mu_{AGSCB} \\ \mu_{INSCB} \\ \mu_{TTSERSCB} \\ \mu_{AGSVA} \\ \mu_{INSVA} \\ \mu_{TTSERSVA} \end{bmatrix} + \sum_{j=1}^{m} \Pi_j \begin{bmatrix} AGPB_{t-1} \\ INPB_{t-1} \\ TTSERPB_{t-1} \\ AGSCB_{t-1} \\ INSCB_{t-1} \\ TTSERSCB_{t-1} \\ AGSVA_{t-1} \\ INSVA_{t-1} \\ TTSERSVA_{t-1} \end{bmatrix} + \begin{bmatrix} e_t^{AGPB} \\ e_t^{INPB} \\ e_t^{TTSERPB} \\ e_t^{AGSCB} \\ e_t^{INSCB} \\ e_t^{TTSERSCB} \\ e_t^{AGSVA} \\ e_t^{INSVA} \\ e_t^{TTSERSVA} \end{bmatrix} \cdots\cdots\cdots\cdots (2)$$

Here, endogenous variables, $y_t = Z'$ is a (9×1) matrix of dependent variables, μ is a (9×1) matrix of intercepts, Π_j is a (9×9) matrix of coefficients for the j^{th} and e_t represents the reduced–form residuals such that $e_t\,(0, \Sigma_e)$. Equation (2), however, is subjected to modification under the presence of non–stationary variables, i.e., variables integrated of order one, $I(1)$.

Our basic objective is to analyse the interaction between the growths of our 'nine' system variables. In time series econometrics, such an objective could be achieved by considering the variables in their 'first differences' than in levels. Therefore, our actual VAR of analysis would be contained in Δy_t which makes equation (2) look like –

$$\begin{bmatrix} \Delta AGPB_t \\ \Delta INPB_t \\ \Delta TTSERPB_t \\ \Delta AGSCB_t \\ \Delta INSCB_t \\ \Delta TTSERSCB_t \\ \Delta AGSVA_t \\ \Delta INSVA_t \\ \Delta TTSERSVA_t \end{bmatrix} = \begin{bmatrix} \mu_{AGPB} \\ \mu_{INPB} \\ \mu_{TTSERPB} \\ \mu_{AGSCB} \\ \mu_{INSCB} \\ \mu_{TTSERSCB} \\ \mu_{AGSVA} \\ \mu_{INSVA} \\ \mu_{TTSERSVA} \end{bmatrix} + \sum_{j=1}^{m} \Pi_j \begin{bmatrix} \Delta AGPB_{t-1} \\ \Delta INPB_{t-1} \\ \Delta TTSERPB_{t-1} \\ \Delta AGSCB_{t-1} \\ \Delta INSCB_{t-1} \\ \Delta TTSERSCB_{t-1} \\ \Delta AGSVA_{t-1} \\ \Delta INSVA_{t-1} \\ \Delta TTSERSVA_{t-1} \end{bmatrix} + \begin{bmatrix} e_t^{AGPB} \\ e_t^{INPB} \\ e_t^{TTSERPB} \\ e_t^{AGSCB} \\ e_t^{INSCB} \\ e_t^{TTSERSCB} \\ e_t^{AGSVA} \\ e_t^{INSVA} \\ e_t^{TTSERSVA} \end{bmatrix} \cdots\cdots\cdots\cdots (3)$$

In next step, we obtain the optimal lag–length by using the conventional techniques of – Akaike Information Criteria (AIC), Schwartz Bayesian Information Criteria (SBIC) and Hannan–Quinn Information Criteria (HQIC). In our case, AIC selected two lags while SBIC and HQIC chose one lag. According to Lütkepohl (2005), minimisation of AIC could overestimate the true lag order and provide inconsistent estimate. Thus SBIC and HQIC are theoretically more preferred over AIC. Following such reasoning, we proceed with lag one obtained in SBIC.

Besides, Indian economy has undergone a shift in its policy regime during the mid–1990s (around 1995). Capturing the impact of policy changes does not qualify as the objective of this chapter. We are rather more keen on capturing the empirical evidence related to the channels of transmission of financial flows in a sector–specific manner. However, we do not discard such 'regime shift' and have incorporated a 'regime dummy' – REG(1 for years≥ 1995 and 0 otherwise) in our VAR–specification.

Thus, our nine–dimensional stationary and stable $VAR(1)$ process of equation (2) could be expressed with exogenous time–dummy (REG) as –

$$\begin{bmatrix} \Delta AGPB_t \\ \Delta INPB_t \\ \Delta TTSERPB_t \\ \Delta AGSCB_t \\ \Delta INSCB_t \\ \Delta TTSERSCB_t \\ \Delta AGSVA_t \\ \Delta INSVA_t \\ \Delta TTSERSVA_t \end{bmatrix} = \begin{bmatrix} \pi_{11} & \pi_{12} & \pi_{13} & \pi_{14} & \pi_{15} & \pi_{16} & \pi_{17} & \pi_{18} & \pi_{19} \\ \pi_{21} & \pi_{22} & \pi_{23} & \pi_{24} & \pi_{25} & \pi_{26} & \pi_{27} & \pi_{28} & \pi_{29} \\ \pi_{31} & \pi_{32} & \pi_{33} & \pi_{34} & \pi_{35} & \pi_{36} & \pi_{37} & \pi_{38} & \pi_{39} \\ \pi_{41} & \pi_{42} & \pi_{43} & \pi_{44} & \pi_{45} & \pi_{46} & \pi_{47} & \pi_{48} & \pi_{49} \\ \pi_{51} & \pi_{52} & \pi_{53} & \pi_{54} & \pi_{55} & \pi_{56} & \pi_{57} & \pi_{58} & \pi_{59} \\ \pi_{61} & \pi_{62} & \pi_{63} & \pi_{64} & \pi_{65} & \pi_{66} & \pi_{67} & \pi_{68} & \pi_{69} \\ \pi_{71} & \pi_{72} & \pi_{73} & \pi_{74} & \pi_{75} & \pi_{76} & \pi_{77} & \pi_{78} & \pi_{79} \\ \pi_{81} & \pi_{82} & \pi_{83} & \pi_{84} & \pi_{85} & \pi_{86} & \pi_{87} & \pi_{88} & \pi_{89} \\ \pi_{91} & \pi_{92} & \pi_{93} & \pi_{94} & \pi_{95} & \pi_{96} & \pi_{97} & \pi_{98} & \pi_{99} \end{bmatrix} \times$$

$$\begin{bmatrix} \Delta AGPB_{t-1} \\ \Delta INPB_{t-1} \\ \Delta TTSERPB_{t-1} \\ \Delta AGSCB_{t-1} \\ \Delta INSCB_{t-1} \\ \Delta TTSERSCB_{t-1} \\ \Delta AGSVA_{t-1} \\ \Delta INSVA_{t-1} \\ \Delta TTSERSVA_{t-1} \end{bmatrix} + \begin{bmatrix} \mu_{AGPB} \\ \mu_{INPB} \\ \mu_{TTSERPB} \\ \mu_{AGSCB} \\ \mu_{INSCB} \\ \mu_{TTSERSCB} \\ \mu_{AGSVA} \\ \mu_{INSVA} \\ \mu_{TTSERSVA} \end{bmatrix} + \begin{bmatrix} REG_{AGPB} \\ REG_{INPB} \\ REG_{TTSERPB} \\ REG_{AGSCB} \\ REG_{INSCB} \\ REG_{TTSERSCB} \\ REG_{AGSVA} \\ REG_{INSVA} \\ REG_{TTSERSVA} \end{bmatrix} + \begin{bmatrix} e_t^{AGPB} \\ e_t^{INPB} \\ e_t^{TTSERPB} \\ e_t^{AGSCB} \\ e_t^{INSCB} \\ e_t^{TTSERSCB} \\ e_t^{AGSVA} \\ e_t^{INSVA} \\ e_t^{TTSERSVA} \end{bmatrix} \ldots\ldots (4)$$

Our estimation has the sole purpose of understanding the dynamics of the growth in sectoral value–added (SVA) amongst themselves and on sectoral deployment of banking credit in an atmosphere characterised with growth in public investment. The standard practice to analyse such dynamics is by obtaining the impulse response functions (IRFs) and structural forecast error decompositions (SFEVDs). This requires the construction of a structural vector autoregressive (SVAR) model with the system variables. Therefore, in order to investigate the impact of growth rates, we have constructed a nine–variable VAR in 'first difference'.

Although IRFs serve as the most practiced tool in unveiling the interrelationship between the variables in a VAR, their interpretations are not straightforward. Impulse responses are not unique and it is often not clear that which set of impulse responses actually reflect the underlying process of the system of variables (Lütkepohl, 2005, pp. 357–384). Since different sets of impulses can be computed from the same underlying VAR, non–sample information are often used to determine the proper set of impulses for a particular model or set of variables. Such information, in the form of structural restrictions are utilised in order to identify the relevant innovations and impulse responses. The resulting models are known as structural VAR (SVAR) models (Sims, 1980, 1986; Bernanke, 1986; Blanchard & Quah, 1989).

The stochastic part required for such structural modelling and corresponding impulse responses could be expressed by dropping the intercept and exogenous terms from equation (4) as –

$$y_t = \sum_{j=1}^{m} \Pi_j y_{t-j} + e_t \dots \dots \dots \dots (5)$$

Equation (5) is basically the VAR in reduced–form. Such a VAR usually has an infinite (∞) order Wold Moving Average (MA) representation as –

$$y_t = \sum_{j=0}^{\infty} \varphi_j e_{t-j} \dots\dots\dots\dots (6)$$

where, $\varphi_s = \sum_{j=1}^{s} \varphi_{s-j}\Pi_j$ with $\varphi_0 = I_K$ for all $s = 1(1)\infty$.

For us, $y_t{}' = (\Delta AGPB_t, \Delta INPB_t, \Delta TTSERPB_t, \Delta AGSCB_t, \Delta INSCB_t, \Delta TTSERSCB_t,$ $\Delta AGSVA_t, \Delta INSVA_t, \Delta TTSERSVA_t)$ is characterised with $p = 9$ and $m = 1$.

A fundamental problem in working with reduced form VAR is that the errors remain correlated with each other. As such, imposition of restriction becomes necessary for identifying the equations. Amongst various techniques (Amisano & Giannini, 1997), the popular technique in arriving at the structural–form equations from reduced form is the consideration of Cholesky ordering. However, it is an ad–hoc method and Sims (1986) have cautioned against using it.

Generally, in IRF analysis the emphasis has shifted from specifying the relationship between the observable variables directly to interpreting the unexpected part of their changes or the shocks. Therefore, it is not uncommon to identify the $(p \times 1)$ structural shocks (ε_t) directly from the $(p \times 1)$ forecast errors or reduced form residuals (e_t). One way to do so is to think of the forecast errors as linear functions of the structural innovations. In that case, we will have the following relationship –

$$e_t = B\varepsilon_t \qquad \dots\dots\dots\dots (7)$$

Hence, $\Sigma_e = B\Sigma_\varepsilon B'$, such that $E(e_t e_t') = BE(\varepsilon_t \varepsilon_t')B'$. Normalising the variances of the structural innovations to one, i.e., assuming $\varepsilon_t \left(0, I_p\right)$, leads to –

$$\Sigma_e = BB' \qquad \dots\dots\dots\dots (8)$$

Due to symmetry of the covariance matrix, this relation specify only $p\,(p+1)/2$ different equations and we require $p\,(p-1)/2$ further relations to identify all p^2 elements of B.

In econometric literature on SVAR, model in equation (7) is known as B–model (Lütkepohl, 2005, pp. 362–364) and in our case of nine variables, it requires a total of 'thirty–six' $\left[\frac{1}{2}\{9 \times (9-1)\} = 36\right]$ restrictions for identification. Therefore, in every time–period t, the relationship between the reduced–form errors, e_t and the orthogonal innovations, ε_t is –

$$\begin{bmatrix} e_t^{AGPB} \\ e_t^{INPB} \\ e_t^{TTSERPB} \\ e_t^{AGSCB} \\ e_t^{INSCB} \\ e_t^{TTSERSCB} \\ e_t^{AGSVA} \\ e_t^{INSVA} \\ e_t^{TTSERSVA} \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} & b_{13} & b_{14} & b_{15} & b_{16} & b_{17} & b_{18} & b_{19} \\ b_{21} & b_{22} & b_{23} & b_{24} & b_{25} & b_{26} & b_{27} & b_{28} & b_{29} \\ b_{31} & b_{32} & b_{33} & b_{34} & b_{35} & b_{36} & b_{37} & b_{38} & b_{39} \\ b_{41} & b_{42} & b_{43} & b_{44} & b_{45} & b_{46} & b_{47} & b_{48} & b_{49} \\ b_{51} & b_{52} & b_{53} & b_{54} & b_{55} & b_{56} & b_{57} & b_{58} & b_{59} \\ b_{61} & b_{62} & b_{63} & b_{64} & b_{65} & b_{66} & b_{67} & b_{68} & b_{69} \\ b_{71} & b_{72} & b_{73} & b_{74} & b_{75} & b_{76} & b_{77} & b_{78} & b_{79} \\ b_{81} & b_{82} & b_{83} & b_{84} & b_{85} & b_{86} & b_{87} & b_{88} & b_{89} \\ b_{91} & b_{92} & b_{93} & b_{94} & b_{95} & b_{96} & b_{97} & b_{98} & b_{99} \end{bmatrix} \times \begin{bmatrix} \varepsilon_t^{AGPB} \\ \varepsilon_t^{INPB} \\ \varepsilon_t^{TTSERPB} \\ \varepsilon_t^{AGSCB} \\ \varepsilon_t^{INSCB} \\ \varepsilon_t^{TTSERSCB} \\ \varepsilon_t^{AGSVA} \\ \varepsilon_t^{INSVA} \\ \varepsilon_t^{TTSERSVA} \end{bmatrix} \ldots\ldots(9)$$

where, e_t^k and ε_t^k are the regression residual from the k^{th} equation of VAR and pure orthogonal shock to the variables. Also, b_{ij} are the (9×9) parameters of the matrix B for all $i, j = 1(1)9$.

Next, we impose restrictions on B matrix in equation (9) in order to identify all the ε_t^k shocks. For diagonalising the shocks we impose restriction on basis of the following assumptions –

(i) Public sector investment and deployment of bank credit for the k^{th} sector affects growth in output of the k^{th} sector and does not impact the output growth of m^{th} sector for all $k, m \in \{AG, IN, TTSER\}$ and $k \neq m$. Also, growth-promoting public sector investment and deployed bank credit depend on output of that sector.

(ii) Sectoral interlinkage between the k^{th} sector and the m^{th} sector operates only at the level of output for all $k, m \in \{AG, IN, TTSER\}$ and $k \neq m$. In presence of inter–sectoral linkage, this implies that the final output of one sector is growth enhancing for the other sectors. Thus, sector–specific credit impacts output of that sector directly and of the other sectors indirectly.

(iii) For any sector, we assume independence between the decisions of sectoral credit allocation undertaken by commercial banks (as financial intermediaries) and the expenditure decisions undertaken by the government (central and state) in providing the infrastructure and other sectoral facilities (say, construction of roads, etc.). This happens because commercial banks intend to direct resources (credit flows) to the most profitable sector whereas government decision are usually developmental in nature and does not seek for profit, in general.

With the above assumptions, our intended B matrix for 'sectoral interlinkage' is –

$$\begin{bmatrix} e_t^{AGPB} \\ e_t^{INPB} \\ e_t^{TTSERPB} \\ e_t^{AGSCB} \\ e_t^{INSCB} \\ e_t^{TTSERSCB} \\ e_t^{AGSVA} \\ e_t^{INSVA} \\ e_t^{TTSERSVA} \end{bmatrix} = \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 & 0 & b_{17} & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 & 0 & 0 & b_{28} & 0 \\ 0 & 0 & b_{33} & 0 & 0 & 0 & 0 & 0 & b_{39} \\ 0 & 0 & 0 & b_{44} & 0 & 0 & b_{47} & 0 & 0 \\ 0 & 0 & 0 & 0 & b_{55} & 0 & 0 & b_{58} & 0 \\ 0 & 0 & 0 & 0 & 0 & b_{66} & 0 & 0 & b_{69} \\ b_{71} & 0 & 0 & b_{74} & 0 & 0 & b_{77} & b_{78} & b_{79} \\ 0 & b_{82} & 0 & 0 & b_{85} & 0 & b_{87} & b_{88} & b_{89} \\ 0 & 0 & b_{93} & 0 & 0 & b_{96} & b_{97} & b_{98} & b_{99} \end{bmatrix} \times \begin{bmatrix} \varepsilon_t^{AGPB} \\ \varepsilon_t^{INPB} \\ \varepsilon_t^{TTSERPB} \\ \varepsilon_t^{AGSCB} \\ \varepsilon_t^{INSCB} \\ \varepsilon_t^{TTSERSCB} \\ \varepsilon_t^{AGSVA} \\ \varepsilon_t^{INSVA} \\ \varepsilon_t^{TTSERSVA} \end{bmatrix} \ldots\ldots (10)$$

The final step is to obtain the structural IRF and h–step ahead FEVD of the system in equation (10). Substitution of equation (7) in (6) yields a relationship between the system variables (y_t) and white–noise structural innovations (ε_t) where $\varepsilon_t\left(0, \Sigma_\varepsilon = I_p\right)$ as –

$$y_t = \sum_{j=0}^{\infty} \varphi_j B \varepsilon_{t-j} = \sum_{j=0}^{\infty} \Psi_j \varepsilon_{t-j} \ldots\ldots\ldots\ldots (11)$$

where, $\Psi_j = \varphi_j B$ for all $j = 1(1)\infty$.

3.3 Data

All data have been collected combining the various issues of *National Accounts Statistics (NAS)*, published by the Ministry of Statistics and Programme Implementation (MOSPI), Government of India (GOI) and *Basic Statistical Returns (BSR)* published by RBI. While *NAS*, MOSPI provides data on GVA and PB for all the three sectors, sectoral data on SCB have been collected from $BSR,$ RBI. Collection of data, however, remained challenging due to non–symmetry in the availability of data. Although data on GVA are available from 1950, data on sectoral public investment are available from 1960 and that on sectoral credit disbursement are available from 1972 only. As such, our sample period runs from 1972 to 2019 and could not incorporate the immediate years of Bank Nationalisation in 1969. Moreover, BSR data on credit disbursement remained highly mixed up from 1972 to 1980. For example, plantation and allied activities were excluded from agriculture till 1976, personal loans include loans for consumer durables in 1972, transport and personal loans were included in Industry under Personal and Professional Services until 1976 etc.

Additionally, we could not consider all the sub–sectors of agriculture and service sector. Our series on agriculture excludes the primary sector activity of 'forestry and logging'. In case of service sector only 'trade' and 'transportation' have been considered because data on credit disbursement for all years are available for those activities only. Only industry sector includes all the secondary sector activities.

Finally, data on credit flows are in current prices, therefore, we collected data on Wholesale Price Index (WPI) available from the *Database on Indian Economy (DBIE),* RBI and applied splicing method to derive the constant 2011–12 price values of the credits. Therefore, the results of our chapter are free from all fluctuations arising due to inflationary effects.

Table 3.1: Descriptive statistics of the variables

Variables (At Levels)	Obs.	Mean	SD	Median	Maximum	Minimum
$AGSVA$	48	13.59033	0.47642	13.62485	12.72819	14.40534
$INSVA$	48	13.79484	0.84025	13.77312	12.52758	15.19592
$TTSERSVA$	48	12.9081	0.96982	12.82403	11.44178	14.65300
$AGSCB$	48	0.20401	0.19618	0.09814	0.02590	0.65476
$INSCB$	48	0.42248	0.20172	0.33725	0.20823	0.82415
$TTSERSCB$	48	0.35659	0.08538	0.35220	0.15037	0.49481
$AGPB$	48	0.03029	0.01154	0.02728	0.01531	0.06008
$INPB$	48	0.11655	0.02922	0.11019	0.07261	0.18401
$TTSERPB$	48	0.06669	0.03193	0.05872	0.03036	0.14556

Source: Author's calculation. Here, PB = public investment to agriculture (AG), industry (IN) and trade and transport sub–sector of service (TTSER); SCB = scheduled commercial bank credit to them; SVA = sectoral gross value added by them; Obs. = total observation; SD = standard deviation.

3.4 Results and Discussion

All estimations have been carried out using STATA version 14. Further, our tests and estimates have been carried out with lag one determined using the techniques discussed in Section 3.2. To initiate further discussion, we begin by providing a visual representation of the growth rate of our variables (Figure 3.1) observed during the period of 1972–2019. The figure shows that each process is oscillating about some fixed mean. However, sophisticated econometric techniques are required to confirm it.

As testing procedure, we begin with the testing of non–stationarity by applying the standard unit root tests – augmented Dickey–Fuller (ADF) test due to Said and Dickey (1984), Phillips–Perron (PP) test due to Phillips and Perron (1988) and Dickey–Fuller generalised least square (DF–GLS) test due to Elliot et al. (1996) to test the null of unit root against no unit root alternative. Our results are cross–validated by KPSS test due to Kwiatkowski et al. (1992) which tests the null of no unit root against unit root alternative. All the tests confirm that our variables are stationary, i.e., integrated of order zero, I(0).

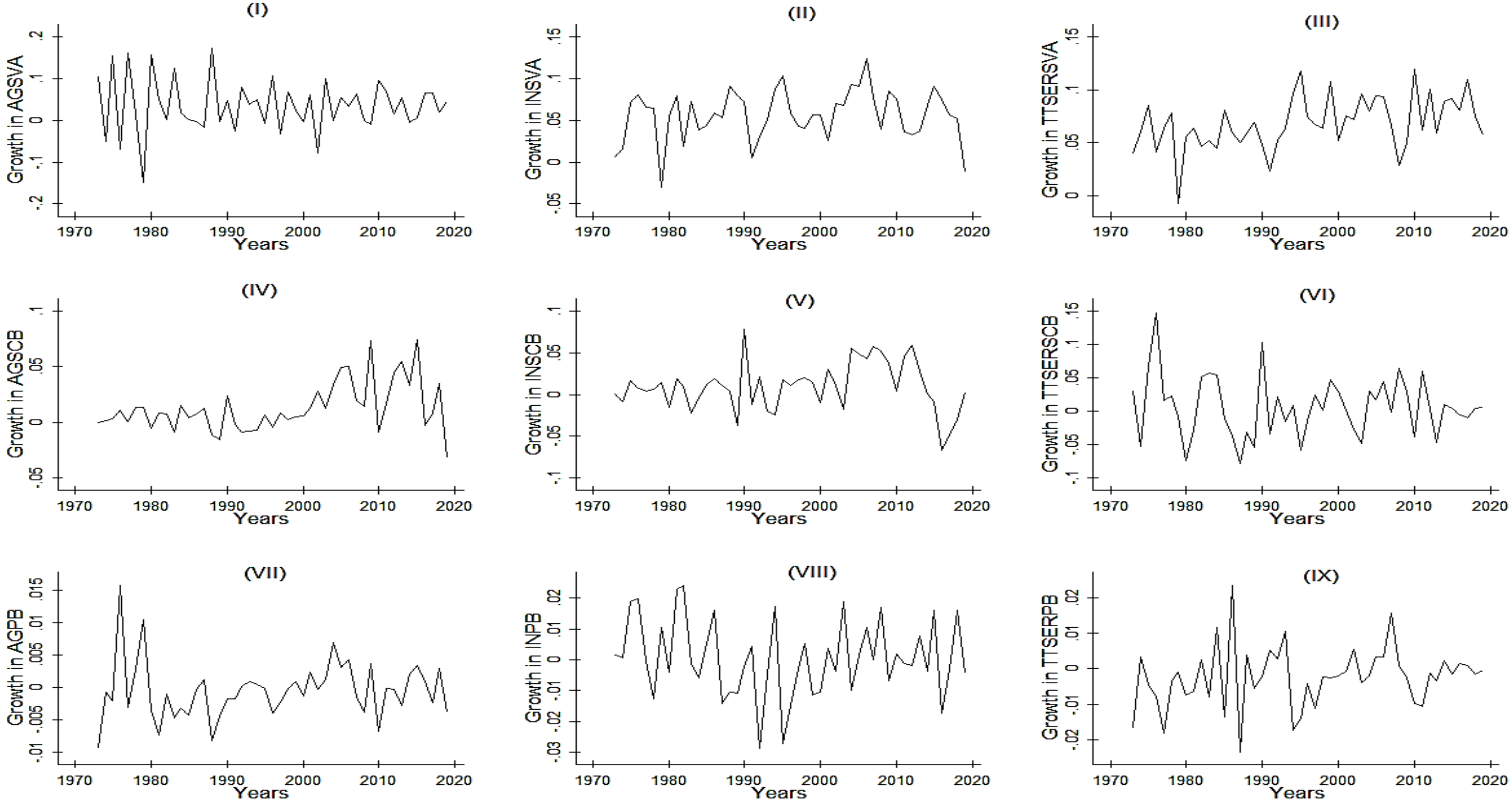
From Table 3.2 and Table 3.3, we observe that all the nine variables of our system are I(0), i.e., stationary because the unit root null has been significantly rejected by all the tests. As such, we could proceed to construct a nine variable–VAR and further towards their system dynamics. Table 3.4 and Table 3.5 reports the VAR(1) estimates as per equation (4).

We have incorporated a time–dummy, REG to capture the impact of 'regime–shift' in our system. As evident from Table 3.5, such an impact, although positive, is very small (<1%) on the real growth in AGSVA (0.45%) and INSVA (0.72%). Interestingly, there is a positive impact of such shift on TTSERSVA (2.75%) and on banking credit for all sectors. However, our results show that such impacts are not that significant for the variables of primary concern.

Next, we estimate equation (11) with 36 restrictions for exact identification. However, testing the impact of credit deployment on sectoral output and intersectoral linkage required 54 restrictions resulting into a χ^2 value of 27.95 with 18 degrees of freedom (there are total 'eighteen' overidentifying restrictions), the p–value of which is 0.063. Therefore, our shocks in equation (11) are valid.

In next step we approach to estimate the corresponding $B-$ matrix as in equation (10). Thus,

Figure 3.1: Growth rates of the variables under study



Source: Computed from NAS, MOSPI and BSR, RBI various issues. Here, PB = public investment to agriculture (AG), industry (IN) and trade and transport sub–sector of service (TTSER), SCB = scheduled commercial bank credit to them, SVA = sectoral gross value added by them.

Table 3.2: Result of unit-root tests (at first difference) Part I

	ADF Test Results			PP Test Results			DF–GLS Test Results			KPSS Test Results		
Series	**Test Result**	**Critical Values (at 1% & 5%)**	**Nature of Test**	**Test Result**	**Critical Values (at 1% & 5%)**	**Nature of Test**	**Test Result**	**Critical Values (at 1% & 5%)**	**Nature of Test**	**Test Result**	**Critical Values (at 1% & 5%)**	**Nature of Test**
$\Delta AGSVA$	–12.38**	(–4.187)	Int, T,	–15.81**	(–4.187)	Int, T,	–6.624 **	(–3.770)	Int, T,	0.031	(0.216)	Int, T,
$\Delta INSVA$	–4.761 **	(–3.516)	L=1	–4.606**	(–3.516)	L=1	–4.038**	(–3.195)	L=1	0.080	(0.146)	L=1
$\Delta TTSERSVA$	–6.571**			–6.566**			–5.062**			0.052		
$\Delta AGSCB$	–5.671**			–5.912**			–3.664**			0.142		
$\Delta INSCB$	–4.662**			–4.765**			–3.416**			0.127		

*Source: Author's calculation. Here, ***, **,* corresponds to rejection of null hypothesis at significance level of 1%, 5% and 10% respectively.*

Table 3.3: Result of unit-root tests (at first difference) Part II

	ADF Test Results			PP Test Results			DF–GLS Test Results			KPSS Test Results		
Series	**Test Result**	**Critical Values (at 1% & 5%)**	**Nature of Test**	**Test Result**	**Critical Values (at 1% & 5%)**	**Nature of Test**	**Test Result**	**Critical Values (at 1% & 5%)**	**Nature of Test**	**Test Result**	**Critical Values (at 1% & 5%)**	**Nature of Test**
$\Delta TTSERSCB$	–5.910**	(–4.187)	Int, T,	–5.87*	(–4.187)	Int, T,	–4.726**	(–3.770)	Int, T,	0.063	(0.216)	Int, T,
$\Delta AGPB$	–6.736**	(–3.516)	L=1	–6.75*	(–3.516)	L=1	–3.601**	(–3.195)	L=1	0.069	(0.146)	L=1
$\Delta INPB$	–6.796 **			–6.80*			–5.432			0.155		
$\Delta TTSERPB$	–8.986**			–8.78*			–3.586 **			0.048		

*Source: Author's calculation. Here, ***, **, * corresponds to rejection of null hypothesis at significance level of 1%, 5% and 10% respectively.*

Table 3.4: Result of VAR estimation Part I

	Dependant Variables								
Explanatory Variable	$\Delta AGPB_t$ (1)	$\Delta INPB_t$ (2)	$\Delta TTSERPB_t$ (3)	$\Delta AGSCB_t$ (4)	$\Delta INSCB_t$ (5)	$\Delta TTSERSCB_t$ (6)	$\Delta AGSVA_t$ (7)	$\Delta INSVA_t$ (8)	$\Delta TTSERSVA_t$ (9)
$\Delta AGPB_{t-1}$	0.0716	–0.5940	–0.4517	–0.3038	0.1591	–1.0829	3.2998	2.6674**	1.0701
	[0.1732]	[0.5322]	[0.3462]	[0.8630]	[1.1154]	[1.8940]	[2.1876]	[1.2013]	[0.9169]
$\Delta INPB_{t-1}$	0.0701	–0.0739	–0.1346	0.1468	0.4987	0.8667*	–0.1582	0.4374	–0.1414
	[0.0473]	[0.1452]	[0.0945]	[0.2354]	[0.3043]	[0.5168]	[0.5969]	[0.3278]	[0.2502]
$\Delta TTSERPB_{t-1}$	0.0643	0.2918	–0.2606**	0.2026	–0.3361	0.4022**	–1.3485	0.0012	–0.2065
	[0.0655]	[0.2014]	[0.1310]	[0.3265]	[0.4220]	[0.7166]	[0.8277]	[0.4545]	[0.3469]
$\Delta AGSCB_{t-1}$	–0.0106	0.1255	0.1453*	–0.0475	–0.6725**	–0.5276	–0.0579	–0.1634	0.1594
	[0.0376]	[0.1154]	[0.0751]	[0.1871]	[0.2418]	[0.4106]	[0.4742]	[0.2604]	[0.1988]
$\Delta INSCB_{t-1}$	0.0055	0.0304	0.0231	0.2017***	0.5457**	–0.0032	–0.2538	0.1059	–0.2550*
	[0.0228]	[0.0699]	[0.0455]	[0.1133]	[0.1465]	[0.2488]	[0.2873]	[0.1578]	[0.1204]
$\Delta TTSERSCB_{t-1}$	0.0203	0.0325	0.0116	0.0353	–0.1479	0.1659	–0.3636	–0.2487**	–0.0761
	[0.0145]	[0.0446]	[0.0290]	[0.0724]	[0.0935]	[0.1588]	[0.1834]	[0.1007]	[0.0769]

*Source: Author's calculation. Standard error in parentheses. Here, ***, **, * corresponds to rejection of null hypothesis at significance level of 1%, 5% and 10% respectively.*

Table 3.5: Result of VAR estimation Part II

	Dependant Variables								
Explanatory Variables	$\Delta AGPB_t$ (1)	$\Delta INPB_t$ (2)	$\Delta TTSERPB_t$ (3)	$\Delta AGSCB_t$ (4)	$\Delta INSCB_t$ (5)	$\Delta TTSERSCB_t$ (6)	$\Delta AGSVA_t$ (7)	$\Delta INSVA_t$ (8)	$\Delta TTSERSVA_t$ (9)
$\Delta AGSVA_{t-1}$	0.0114	–0.0208	0.0031	0.0165	–0.0473	0.0454	–0.4495**	0.0832	0.0649
	[0.0116]	[0.0357]	[0.0232]	[0.0579]	[0.0748]	[0.1271]	[0.1468]	[0.0805]	[0.0615]
$\Delta INSVA_{t-1}$	–0.0299	–0.0486	–0.0309	–0.0956	0.2293	0.1540	0.4323	0.2889	0.0347
	[0.0258]	[0.0792]	[0.0515]	[0.1284]	[0.1660]	[0.2819]	[0.3256]	[0.1788]	[0.1365]
$\Delta TTSERSVA_{t-1}$	0.0838**	0.1899*	0.0265	0.1712	–0.0574	0.3732	–0.7396*	–0.1465	–0.2772
	[0.0343]	[0.1054]	[0.0686]	[0.1709]	[0.2209]	[0.3752]	[0.4333]	[0.2379]	[0.1816]
REG	–0.0007	–0.0093**	–0.0017	0.0159**	0.0172**	0.0001	0.0045	0.0072	0.0275**
	[0.0015]	[0.0047]	[0.0031]	[0.0076]	[0.0098]	[0.0167]	[0.0193]	[0.0106]	[0.0081]
μ	–0.0042**	–0.0055	–0.0043	–0.0037	–0.0035	–0.0243	0.0768**	0.0475**	0.0695**
	[0.0017]	[0.0054]	[0.0035]	[0.0087]	[0.0113]	[0.0191]	[0.0221]	[0.0121]	[0.0093]
R^2	0.2308	0.1568	0.2092	0.2857	0.3132	0.1875	0.4543	0.2278	0.3551

*Source: Author's calculation.. Standard error in parentheses. Here, ***, **, * corresponds to rejection of null hypothesis at significance level of 1%, 5% and 10% respectively.*

Table 3.6: Result of SVAR estimation (B-Matrix)

	B-Matrix								
Coefficients	b_{11}	b_{17}	b_{22}	b_{28}	b_{33}	b_{39}	b_{44}	b_{47}	b_{55}
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
	0.0034**	0.0013**	0.0117**	0.0019	0.0074**	0.0009	–0.0036	0.0191**	0.0239**
	[0.0004]	[0.0006]	[0.0013]	[0.0028]	[0.0008]	[0.0012]	[0.0157]	[0.0036]	[0.0028]
Coefficients	b_{58}	b_{66}	b_{69}	b_{71}	b_{74}	b_{77}	b_{78}	b_{79}	b_{82}
	(10)	**(11)**	**(12)**	**(13)**	**(14)**	**(15)**	**(16)**	**(17)**	**(18)**
	0.0066	–0.0169	0.0371**	–0.0211*	–0.0303**	–0.0150	–0.0180	0.0208**	0.0008
	[0.0062]	[0.0111]	[0.0068]	[0.0120]	[0.0144]	[0.0256]	[0.0158]	[0.0059]	[0.0044]
Coefficients	b_{85}	b_{87}	b_{88}	b_{89}	b_{93}	b_{96}	b_{97}	b_{98}	b_{99}
	(19)	**(20)**	**(21)**	**(22)**	**(23)**	**(24)**	**(25)**	**(26)**	**(27)**
	–0.0031	0.0135**	–0.0244**	0.0053	–0.0048*	0.0168**	0.0058*	–0.0111**	0.0052
	[0.0051]	[0.0041]	[0.0030]	[0.0038]	[0.0027]	[0.0020]	[0.0032]	[0.0034]	[0.0062]

*Source: Author's calculation.. Standard error in parentheses. Here, ***, **, * corresponds to rejection of null hypothesis at significance level of 1%, 5% and 10% respectively.*

our estimated B–matrix is –

$$\begin{bmatrix} e_t^{AGPB} \\ e_t^{INPB} \\ e_t^{TTSERPB} \\ e_t^{AGSCB} \\ e_t^{INSCB} \\ e_t^{TTSERSCB} \\ e_t^{AGSVA} \\ e_t^{INSVA} \\ e_t^{TTSERSVA} \end{bmatrix}$$

$$= \begin{bmatrix} 0.0034 & 0 & 0 & 0 & 0 & 0 & 0.0013 & 0 & 0 \\ 0 & 0.0117 & 0 & 0 & 0 & 0 & 0 & 0.0019 & 0 \\ 0 & 0 & 0.0074 & 0 & 0 & 0 & 0 & 0 & 0.0009 \\ 0 & 0 & 0 & -0.0036 & 0 & 0 & 0.0191 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0.0239 & 0 & 0 & 0.0066 & 0 \\ 0 & 0 & 0 & 0 & 0 & -0.0169 & 0 & 0 & 0.0371 \\ -0.0211 & 0 & 0 & -0.0303 & 0 & 0 & -0.0150 & -0.0180 & 0.0208 \\ 0 & 0.0008 & 0 & 0 & -0.0031 & 0 & 0.0135 & -0.0244 & 0.0053 \\ 0 & 0 & -0.0048 & 0 & 0 & 0.0168 & 0.0058 & -0.0111 & 0.0052 \end{bmatrix}$$

$$+ \begin{bmatrix} \varepsilon_t^{AGPB} \\ \varepsilon_t^{INPB} \\ \varepsilon_t^{TTSERPB} \\ \varepsilon_t^{AGSCB} \\ \varepsilon_t^{INSCB} \\ \varepsilon_t^{TTSERSCB} \\ \varepsilon_t^{AGSVA} \\ \varepsilon_t^{INSVA} \\ \varepsilon_t^{TTSERSVA} \end{bmatrix}$$

Evidently, the residuals of the reduced–form VAR could be identified as a linear combination of their structural innovations as –

$$e_t^{AGPB} = 0.0034\varepsilon_t^{AGPB} + 0.0013\varepsilon_t^{AGSVA}$$
$$e_t^{INPB} = 0.0117\varepsilon_t^{INPB} + 0.0019\varepsilon_t^{INSVA}$$
$$e_t^{TTSERPB} = 0.0074\varepsilon_t^{TTSERPB} + 0.0009\varepsilon_t^{TTSERSVA}$$
$$e_t^{AGSCB} = -0.0036\varepsilon_t^{AGSCB} + 0.0191\varepsilon_t^{AGSVA}$$
$$e_t^{INSCB} = 0.0239\varepsilon_t^{INSCB} + 0.0066\varepsilon_t^{INSVA}$$
$$e_t^{TTSERSCB} = -0.0169\varepsilon_t^{TTSERSCB} + 0.0371\varepsilon_t^{TTSERSVA}$$

$$e_t^{AGSVA} = -0.0211\varepsilon_t^{AGPB} - 0.0303\varepsilon_t^{AGSCB} - 0.0150\varepsilon_t^{AGSVA} - 0.0180\varepsilon_t^{INSVA} + 0.0208\varepsilon_t^{TTSERSVA}$$

$$e_t^{INSVA} = 0.0008\varepsilon_t^{INPB} - 0.0031\varepsilon_t^{INSCB} + 0.0135\varepsilon_t^{AGSVA} - 0.0244\varepsilon_t^{INSVA} - 0.0053\varepsilon_t^{TTSERSVA}$$

$$e_t^{TTSERSVA} = -0.0048\varepsilon_t^{TTSERPB} + 0.0168\varepsilon_t^{TTSERSCB} + 0.0058\varepsilon_t^{AGSVA} - 0.0111\varepsilon_t^{INSVA} + 0.0052\varepsilon_t^{TTSERSVA}$$

From such a structure, we are interested in exploring the system behaviour when allowed for an unexpected one standard deviation change in structural shocks. For such a system, Figure 3.2 and Table 3.6 captures the short run impulse responses and the variance decomposition respectively. Here, it should be recalled that we have assumed each sector to get affected by – (i) public investment and credit deployment of itself and (ii) sectoral output of other sectors.

Figure 3.2 shows the impulses, i.e., responses in sectoral growth rate of every sector due to one standard deviation change in structural error of – its own, in output growth of other sectors, in growth of banking credit disbursed to the sector and in growth of public investment directed to that sector (in order from left to right) over a 10 year time–horizon.

As we could see, all shocks (one standard deviation change in structural error of one variable while considering the other errors as zero) are fading away within a span of 5–6 years confirming both the stability and the short–run nature of our system. It is evident from Figure 3.2 that there is a positive linkage between the growth rates of the sectors because instantaneous response of every sector to a unit shock in growth rates of other sectors is positive. However, such a one–time shock begins to fade in successive periods. Only in case of trade and transport sub–sector of service (TTSER) the impulse due to response to a shock in growth of agricultural sector, remains static in next period. We could say that an increase in agricultural output boosts the output of trade and transport sub–sector but its actual realisation occurs only in next period.

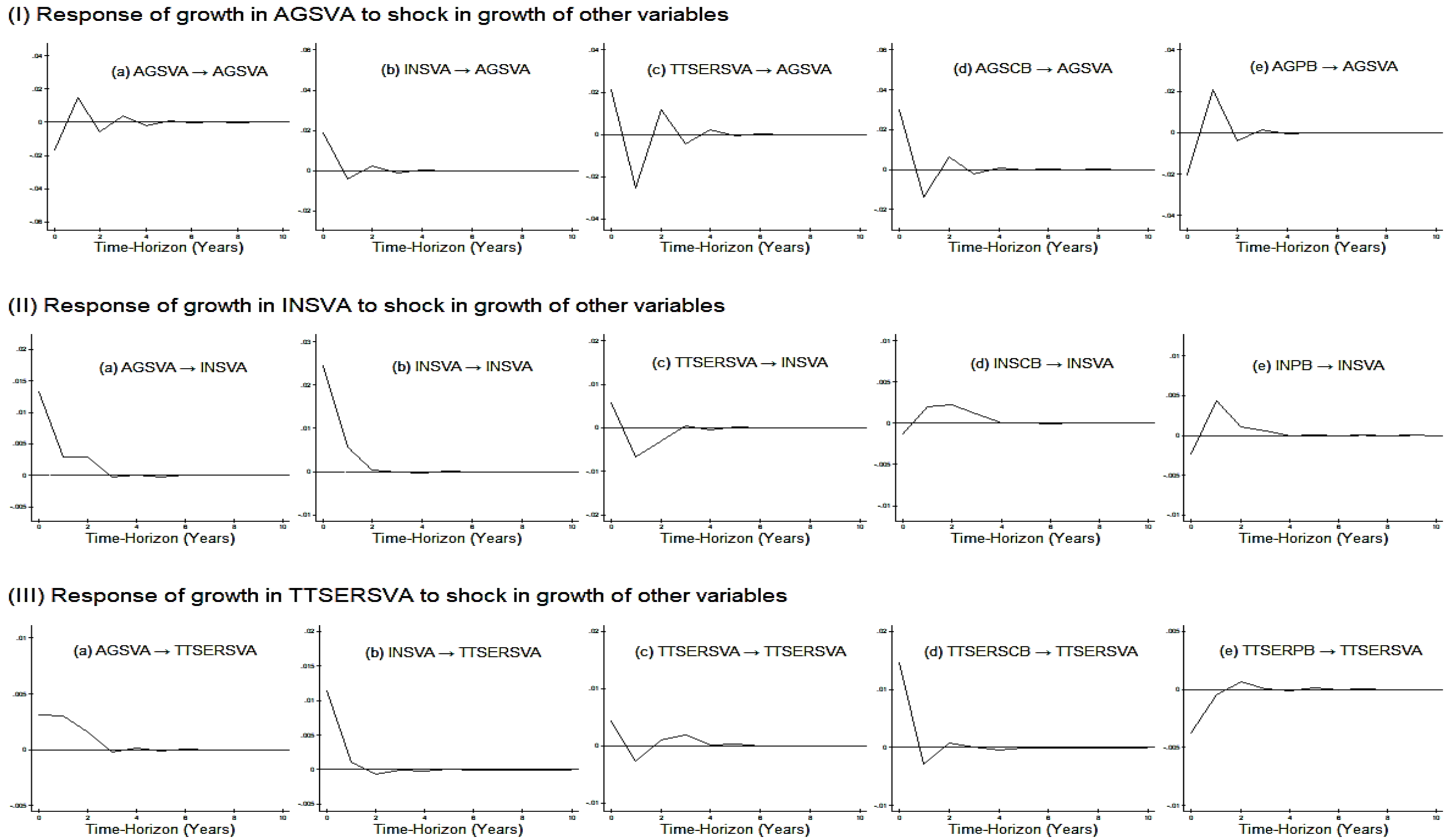
The boost due to growth in sectoral credit disbursement, as we could see, renders instantaneous positive impact on output growth rate for both agriculture and TTSER sector. For industry sector, the response is positive from the first period and remains so for a period more prolonged than that in agriculture and TTSER sector. This is possible because we have considered the current period ratios. A boost in credit supplied requires to be utilised in form of investment for capital goods and therefore, a lagged response instead of immediate realisation is reasonable.

Growth in sectoral public investment is also creating positive impact for growth in sectoral output of the corresponding sector but with a delay. To such an increase, growth in TTSER responds more slowly than that of the growth in agriculture and industry sector. A plausible reasoning of which could again be the consideration of current period ratios. Indeed, fiscal strategies would require time to get channelised and absorbed into the sectoral behaviour.

Having discussed the impulse responses of the variables, we discuss the relative contribution of the growth in sectoral output, sectoral credit flow and public investment in explaining the forecast error variance of the *h*–step ahead forecast error of output growth of each sector. For this purpose, we need to rely on Table 3.6. Since all impacts of a one–time shock fades away within 5–6 years, we could see that our variances, ahead of 6–step are also stagnant.

There exists an undeniable importance of banking credit in facilitating the growth of agriculture and TTSER sector. About 37% variation in growth of agricultural output and 55% of variation in growth of TTSER sector output could be explained by growth in bank credit disbursed to those sectors at shorter horizon of 1–period. Although it reduces at longer horizon, but still remains one of the significant explanatory variable – about 25% for agriculture and 46.4% for TTSER sector growth at a horizon of 4–6 steps ahead. However, the contribution of the growth

Figure 3.2: Sectoral impulse response analysis



Source: Author's calculation. Impulse responses computed on basis of Monte Carlo simulation using 200 replications for 10 periods.

Table 3.7: Result of FEVD estimation

Structural Shocks		Impact Horizon (in Years) Ahead					
Response	**Impulse**	**1**	**2**	**4**	**6**	**8**	**10**
	ΔAGSVA	0.1155	0.1236	0.1232	0.1239	0.1239	0.1239
	ΔINSVA	0.1498	0.0942	0.0869	0.0865	0.0865	0.0865
ΔAGSVA	ΔTTSERSVA	0.1854	0.2692	0.2782	0.2781	0.2781	0.2781
	ΔAGSCB	0.3714	0.2691	0.2533	0.2525	0.2525	0.2525
	ΔAGPB	0.1778	0.2126	0.1958	0.1951	0.1951	0.1951
	ΔAGSVA	0.2166	0.1881	0.1864	0.1863	0.1863	0.1863
	ΔINSVA	0.7354	0.6422	0.6097	0.6074	0.6074	0.6074
ΔINSVA	ΔTTSERSVA	0.0391	0.0764	0.0810	0.0812	0.0812	0.0812
	ΔINSCB	0.0021	0.0059	0.0116	0.0116	0.0116	0.0116
	ΔINPB	0.0068	0.0244	0.0247	0.0246	0.0246	0.0246
	ΔAGSVA	0.0250	0.0404	0.0449	0.0448	0.0448	0.0448
	ΔINSVA	0.3380	0.2857	0.2781	0.2773	0.2773	0.2773
ΔTTSERSVA	ΔTTSERSVA	0.0508	0.0585	0.0664	0.0664	0.0664	0.0664
	ΔTTSERSCB	0.5498	0.4782	0.4651	0.4643	0.4643	0.4643
	ΔTTSERPB	0.0364	0.0311	0.0311	0.0311	0.0311	0.0311

Source: Author's calculation.. FEVD computed on basis of Monte Carlo simulation using 200 replications for 10 periods.

in banking credit disbursed in explaining the growth of industrial output remains very low (0.21%) at 1–period and at 6–period horizon (1.16%). Public investment, on the other hand, renders better impact on industrial sector growth than banking credit (from 0.7% at 1-period horizon to 2.5% at 6–period horizon). This does not imply that banking credit has no impact on industrial output because its significance in long run is growing. All it suggests is that such credit disbursement is inadequate for industry. In fact, it is this inadequacy of banking credit for industries that paved the path for the emergence of the Development Financing Institutions (DFIs) in India.

Finally, as far as the sectoral interlinkage is concerned, growth in the agricultural output contributes effectively (22% at 1–step and 19% at 6–step) in explaining the variation in growth of the industrial output. Similarly, growth in the industrial output contributes effectively (34% at 1–step and 28% at 6–step) in explaining the variation in growth of the TTSER sector output. However, there is growing importance and contribution of agricultural output for TTSER sector (2.5% at 1–step to 4.5% at 6–step) and of TTSER sector output for industry sector (4% at 1–step to 8% at 6–step). Agricultural output, on the other hand, is a composite of the contribution from all other sectors (11.5% from itself, 15% from industry and 18.5% from TTSER) at shorter horizon of 1–period.

The composition, alters more in favour of TTSER sector at longer horizon of 6–periods (12.4% from itself, 8.7% from industry and almost 28% from TTSER). Besides, there is an effective contribution of growth in public investment in explaining the total variation (17.8% at 1–period horizon to 19.5% at 6–period horizon) of growth in agricultural output. In this regard, we find that industrial output alone could explain most of its variation at all horizons (73.5% at short–horizon to 60.7% at long–horizon).

3.5 Conclusion

We employed structural VAR method to assess the impact of bank credit on sectoral output under an environment characterised by the presence of public sector investment and observed that the 'Schumpeterian view' of growth follows financial development (Schumpeter, 1912) holds true at the sectoral level of the Indian economy.

Also, we observe that the growth of banking–finance in the form of sectoral credit allocation provides positive impact on real sector growth. This could be viewed as a channel through which 'finance–growth' nexus is materialising at an aggregate level in India. The transmission initially begins in the form of credit allocation to different sectors due to which, level of sectoral output increases and finally gets culminated in the form of aggregate output of the economy.

From this perspective, the most interesting implication of this chapter lies in the fact that the credit allocated to any one sector, impacts the output of that sector directly and that of the other sectors indirectly. In economics, such a link is termed as the 'sectoral interlinkage'. Therefore, we observe that the sectoral credit allocation by the financial intermediaries are actually explaining and governing the sectoral interlinkages. As such, the growth story of India owes itself to this positive impacts of sectoral credit on the sectoral output of own and other sectors.

Besides, it is observed that a one–time shock in credit allocation, could not render very strong long–run impact for the agriculture and TTSER sector. Interestingly, in case of growth in industry output, there is low but increasing significance of such allocation. As such, we conclude that there is 'less–than desired' impact of banking credit allocation for industrial sector and therefore, it is important to design credit policies in a way that would be more effective for the overall economy.

Undoubtedly, there is an increase in total credit allocation of all sectors. However, we suggest devising of some monitoring mechanism to supervise the intended utilisation of such credit. A more organised and planned disbursement would eventually help in better manifestation of credit for output of all sectors.

Finally, we observe that the growth in real output of all sectors has received positive benefit from the growth in public investment directed towards those sectors. However, the time delay in response of TTSER sector to such an impact, requires fiscal attention. An effective mechanism that accelerates the penetration and utilisation of such investment for all sectors would be more desirable because economic growth depends on sectoral growth performances.

Chapter – 4

Impact on Income Inequality: A Study of the Major Indian States

4.1 Introduction

One of the most desirable impact of economic growth (defined as growth in per-capita income) is to improve the economic condition (standard of living) of the individuals belonging to that economy. Due to which more people could afford to join the financial intermediaries and increase their economic opportunities. In long run, such an increased access contributes in reducing the income-inequality. From this perspective, considering India as a case-study, we inquire whether a growth-promoting financial intermediation (Chapter 2 and Chapter 3) actually help in reducing income-inequality as well. From a theoretical perspective, investigation of such an endogenous evolution of finance, economic growth and change in income-inequality could be termed as 'finance-growth-inequality' nexus and Chapter 4 documents the dynamics of it empirically for 13 major states in India.

In a seminal work, Greenwood and Jovanovic (1990) identifies that financial intermediation promotes growth by allowing the capital to earn higher rate of return whereas, growth on the other hand allows implementation of costly financial structures. Further, economic growth and financial intermediation are inextricably linked as per the Goldsmith-McKinnon-Shaw view on economic development. Despite what remains truly unknown is who benefits from this growth (Levine, 2021). According to Greenwood and Jovanovic (1990), dynamics of financial development resembles 'Kuznets-hypothesis' of economic development in a non-linear manner which increases with the degree of sophistication in the financial system, then stabilises and eventually falls (Claessens & Perotti, 2007; Levine, 2021). Considering this as a benchmark, present chapter investigates the finance-growth-inequality 'nexus' under a panel framework.

Following Greenwood and Jovanovic (1990), a battery of research works have been conducted to unveil the dynamics of finance (rather, financial intermediation) on income inequality. However, the evidence remains inconclusive (Ang, 2010). While Rajan and Zingales (2003) identifies the richer section of the economy to get benefitted from the development in formal financial sector, a second group of researchers (Banerjee & Newman, 1993; Galor & Zeira, 1993; Aghion & Bolton, 1997; Mookherjee & Ray, 2003 amongst others) emphasise on human capital formation and observe that financial development allows correction of market imperfections and could alleviate such income-inequality. There is a third strand of research as well due to Rosenzweig and Wolpin (1993), Paulson and Townsend (2004), Demirgüç-Kunt and Levine (2009) and others which discusses the channels through which savings behaviour affects intergenerational income dynamics.

Although the important roles of access to finance, its intergenerational movement and market frictions in the theories of poverty and income- inequality have been investigated upon, little could adequately address the impact of such development, specifically financial policies on income-inequality. From this context, two novel works are Xu et al. (2003) and Demirgüç-Kunt and Levine (2007). Examining the impact of financial development on Gini coefficient – a standard measure of deviation from the perfect income equality, they establish that financial development results into a lower growth of Gini and higher income of poor. However, Arestis and Caner (2005) observes that such effects are ambiguous in presence of financial liberalisation. Present chapter combines both these approaches.

In context of India, Burges and Pande (2005) as one of the initial works on interaction between financial development and poverty, examines how bank licensing policy helped reduction of poverty in rural areas in pre-reform and post-reform eras. Increase in efficiency, profitability during the post-reform era and their positive impacts on Indian financial system, particularly on banking sector, have been extensively studied in literature (Bhanumurthy & Singh, 2013; Kar & Mandal, 2014 amongst others) as well. However, Das and Guha-Khasnobis (2008) identifies that there is lower credit flow to agricultural sector compared to that to industry sector while Marjit and Das (2008) identifies that aggregate loan has not increased in post-reform period. Regarding access to finance, financial constraint of small firms have been identified in Banerjee and Duflo (2014). In this regard, Ang (2010) deserves a special mention as it intervenes the issue of finance-growth-inequality from the perspective of distributional impact of financial development and financial liberalisation on the Gini coefficient of India over the period of 1951–2004 and observes that financial liberalisation exacerbate income-inequality.

Despite such enriched works, Das et al. (2018) observes remarkably that there is lack of enough evidence to settle the 'nexus' of finance-growth-inequality, particularly for India. Therefore, considering the period from 1990–2012 (also known as liberalisation and post-liberalisation era because the foundations towards a liberalised economy began in 1990 with the end of license raj), present chapter attempts to investigate the impact of financial development via financial depth, economic growth and developmental expenditure (expenditure incurred for providing various social[1] and economic services[2]) of the state governments on the level of Gini coefficients for 13 major states in India. Developmental expenditure of the state governments (a measure of public sector intervention), redistributes the economic resources and therefore, helps in reducing the market friction and inequality. On the other hand, it impacts growth by

[1]Social Services - (i) Education, art and culture, (ii) Scientific services and research, (iii) Medical, public health, sanitation and water supply, (iv) Family welfare, (v) Housing, (vi) Urban development, (vii) Broadcasting, (viii) Labour and employment, (ix) Social security and welfare, (x) Information and publicity, (xi) Others.

[2]Economic Services - (i) Foreign trade and export promotion, (ii) Co-operation, (iii) Investment in general financial and trading institutions, (iv) Investment in international financial institutions, (v) Co-operation, (vi) Special and backward areas, (vii) Foreign trade, (viii) Others.

increasing the productive capacity of the economy through the generation of human capital. Such an importance is already a well-established consensus in endogenous growth models (Lucas, 1988; Romer, 1990; Barro, 1990, 1991). To this framework, present chapter introduces financial development for completing the picture. Through its expansion, financial sector allows the benefits of several developmental expenditure to reach the remote target audience. By doing so it entails both penetration as well as better access to formal finance.

Our contribution is three-fold in nature – (i) investigation of finance-growth-inequality at the state level is the very first in context of India, (ii) consideration of state level per capita income, financial depth and developmental expenditure of state government allows us to create a combination of growth and 'trickle-down' (through per-capita income), level of government initiative (through development expenditure of the state government) and size and access to formal banking (through financial depth) and (iii) data on state level Gini coefficients from 1990-2012 have been obtained by utilising the methodology of Beta Lorenz curve as suggested in Datt and Ravallion (1992). Datt (1997) has utilised the same methodology to determine Gini-coefficient from 1951-1994 at state-level as well as at the country level for India. Consideration of all such important determinants which reduce the income-inequality and application of Datt and Ravallion (1992) is possibly the very first in finance-growth-inequality literature. Further, Gini-coefficients at country level, as in Datt (1997), have been updated up to 2006 in Datt and Ravallion (2011) and up to 2012 in Datt et al. (2016). However, no such exercise was carried out at the state level. As such, we have to estimate it for all the 13 major states.

With this introduction, the chapter has been organised as follows – Section 4.2 discusses the econometric model, Section 4.3 explains data collection and summary statistics, results and interpretations are discussed in Section 4.4 and Section 4.5 concludes.

4.2 Econometric Model

Present chapter resorts to a panel framework in order to elicit the impact of financial development on income-inequality. From an econometric perspective, such an attempt has merit in – (i) capturing state level heterogeneity, i.e. heterogeneity of the individual cross section units and the dynamics of each unit, and (ii) in combining both cross section and time-series variables in one framework. While 13 major states (to be discussed shortly) constitute our cross section units, the information on variables – (i) state Gini coefficient, (ii) financial depth, (iii) state gross domestic product (SGDP), (iv) state population and (v) development expenditure of the state government for the period 1990-2012 constitutes the time-series counterpart. Application of panel vector error correction (PVECM) in disentangling the long run dynamics among the variables have been carried out following the standard approaches of panel unit root tests, panel cointegration test and panel VECM as practised in literature (Rousseau & Wachtel, 2001; Apergis et al., 2007; Lee & Chang, 2009; Akinci et al., 2014).

We assume that for the i^{th} state, the change in income-inequality depends on the growth in per-capita state income (per-capita state GDP), financial depth and the developmental expenditure per unit SGDP incurred by the state government. Therefore, at any time period t [= 1990(1)2012], the functional relationship among the variables could be expressed using a linear panel vector autoregression (PVAR) framework. Therefore, our reduced-form PVAR model with m lags (to be determined shortly) and $k(4)$ endogenous variables, as introduced by Holtz-Eakin et al. (1988) and developed later by Binder et al. (2005), could be expressed as –

$$\begin{bmatrix} LSG_{i,t} \\ FDEP_{i,t} \\ LPCSP_{i,t} \\ DEVR_{i,t} \end{bmatrix} = \begin{bmatrix} \mu_{i,t}^{LSG} \\ \mu_{i,t}^{FDEP} \\ \mu_{i,t}^{LPCSP} \\ \mu_{i,t}^{DEVR} \end{bmatrix} + \sum_{j=1}^{m} A_j \begin{bmatrix} LSG_{i,t-j} \\ FDEP_{i,t-j} \\ LPCSP_{i,t-j} \\ DEVR_{i,t-j} \end{bmatrix} + \begin{bmatrix} e_{i,t}^{LSG} \\ e_{i,t}^{FDEP} \\ e_{i,t}^{LPCSP} \\ e_{i,t}^{DEVR} \end{bmatrix} \cdots\cdots\cdots\cdots (1)$$

Here, $y_{i,t} = [LSG_{i,t}, FDEP_{i,t}, LPCSP_{i,t}, DEVR_{i,t}]'$, $\mu = [\mu_{i,t}]$ is the (4×1) matrix of intercepts,

A_j is the (4×4) matrix of coefficients and $e = [e_{i,t}]$ represents the matrix of the Gaussian residuals. Equation (1), however, is subjected to modification under the presence of variables integrated of order one, I(1) i.e., non-stationary variables.

We define, $PCSP_{i,t} = \frac{SGDP_{i,t}}{N_{i,t}}$; $FDEP_{i,t} = \frac{DEP_{i,t}}{SGDP_{i,t-1}}$; $DEVR_{i,t} = \frac{DEVEX_{i,t}}{SGDP_{i,t}}$ and subsequently

$LSG_{i,t}$ = natural logarithm of state Gini coefficient of the i^{th} state at period t.

$PCSP_{i,t}$ = per-capita state gross domestic product of the i^{th} state at period t.

$LPCSP_{i,t}$ = natural logarithm of $PCSP$ of the i^{th} state at period t.

$SGDP_{i,t}$ = state gross domestic product of the i^{th} state at period t.

$N_{i,t}$ = population of the i^{th} state at period t.

$DEP_{i,t}$ = deposits (demand and time) with the SCBs of the i^{th} state at period t.

$DEVEX_{i,t}$ = developmental expenditure of the government of i^{th} state at period t.

$FDEP_{i,t}$ = financial depth of the financial sector of the i^{th} state at period t.

$DEVR_{i,t}$ = ratio of $DEVEX$ to the $SGDP$ of the i^{th} state at period t.

Gini coefficient is a standard measure of income-inequality. Per-capita gross domestic product and financial depth are popularised in literature as the standard measures of economic growth and financial development respectively. Contribution of developmental expenditure in per unit output has been captured using DEVR. Therefore, all our variables are the standard measures practiced in literature.

Without any prior information on 'who causes whom', we consider all variables as endogenous. Thus, our final objective rests in capturing the dynamics of LSG, $LPCSP$, $FDEP$ and $DEVR$. As testing procedure, we assume independence across i (the cross-section unit) due to Quah

(1994) and apply $t - test$ based Levin, Lin and Chu (2002), $W -$ statistic based Im, Pesaran and Shin (2003) and $z -$ statistic based Hadri (2000) panel unit root tests. We call them LLC, IPS and Hadri-LM tests respectively while reporting the results.

In next step, panel cointegration has been tested using the conventional Pedroni (1999) and Kao (1999) tests. Due to this approach one could test the presence of long-run equilibrium in multivariate panels while allowing both the dynamic as well as the long-run cointegration vectors to be heterogenous across the individual members. Finally, PVECM has been estimated and causal relationships have been tested using the causality analysis introduced by Granger (1969) and developed later by Hamilton (1994).

Application of cointegration technique requires choice of optimal lag-length and stationarity check (whether integrated of order zero, I(0) or not) of the variables under consideration. Applying the standard procedures popular in literature, the optimal lag-length selected by the Schwartz Bayesian Information Criteria (SBIC) and Hannan-Quinn Information Criteria (HQIC) is two while that selected by Akaike Information Criteria (AIC) is three. Owing to Lütkepohl (2005), we proceed with two lags because minimising SBIC and HQIC has theoretical advantage over AIC and in providing consistent estimate of the true lag order whereas minimising AIC could overestimate it with positive probability.

Consistent with the econometric theory, non-stationary variables are required to be cointegrated for any meaningful relation to be present among themselves. According to Engle and Granger (1987), every cointegration relation must be accompanied with an error-correction term (ECT). Under any short-run deviation from the long-run equilibrium, coefficient of ECT will determine the speed of adjustment back to it. Thus, our final model is a PVECM model.

By incorporating ECT term in equation (1) our PVECM model with $m = 2$ lags and $k = 4$ endogenous variables could be compactly expressed as –

$$\begin{bmatrix} \Delta LSG_{i,t} \\ \Delta FDEP_{i,t} \\ \Delta LPCSP_{i,t} \\ \Delta DEVR_{i,t} \end{bmatrix} = \begin{bmatrix} \mu_{i,t}^{LSG} \\ \mu_{i,t}^{FDEP} \\ \mu_{i,t}^{LPCSP} \\ \mu_{i,t}^{DEVR} \end{bmatrix} + \begin{bmatrix} \alpha_{i}^{LSG} \\ \alpha_{i}^{FDEP} \\ \alpha_{i}^{LPCSP} \\ \alpha_{i}^{DEVR} \end{bmatrix} ECT_{i,t-1} + \sum_{j=1}^{2} A_j \begin{bmatrix} \Delta LSG_{i,t-j} \\ \Delta FDEP_{i,t-j} \\ \Delta LPCSP_{i,t-j} \\ \Delta DEVR_{i,t-j} \end{bmatrix} + \begin{bmatrix} e_{i,t}^{LSG} \\ e_{i,t}^{FDEP} \\ e_{i,t}^{LPCSP} \\ e_{i,t}^{DEVR} \end{bmatrix} \cdots\cdots\cdots (2)$$

Here, $\left[LSG_{i,t}, FDEP_{i,t}, LPCSP_{i,t}, DEVR_{i,t}\right]'$ are endogenous variables, $ECT_{i,t-1} = LSG_{i,t-1} - \theta FDEP_{i,t-1} - \psi LPCSP_{i,t-1} - \varphi DEVR_{i,t-1}$ is the error-correction term (or cointegration equation) normalised with respect to $LSG_{i,t-1}$ and represents deviation from the long-run equilibrium in previous period, $\mu = \left[\mu_{i,t}\right]$ and A_j are the (4×1) matrices of intercepts and coefficients of the j^{th} lag respectively. Further, θ, ψ and φ are the coefficient estimates of the variables entering the ECT equation, α_i are the (4×1) coefficients of the ECT term and $e = \left[e_{i,t}\right]$ represents the matrix of Gaussian residuals.

For any i, the ECT has been obtained through the model of the form –

$$\begin{bmatrix} \Delta LSG_{i,t} \\ \Delta FDEP_{i,t} \\ \Delta LPCSP_{i,t} \\ \Delta DEVR_{i,t} \end{bmatrix} = \lambda_{i,t} + \Pi_i \begin{bmatrix} \Delta LSG_{i,t-1} \\ \Delta FDEP_{i,t-1} \\ \Delta LPCSP_{i,t-1} \\ \Delta DEVR_{i,t-1} \end{bmatrix} + e_{i,t} \cdots\cdots\cdots\cdots (3)$$

where, $\lambda_{i,t}$ is the (4×1) intercept term, $y_{i,t}$and e have same specification as before. The matrix, Π_i whose rank, r denotes the number of cointegration relation is decomposable as $\Pi_i = \alpha_i \beta_i{}'$ where α_i is speed of adjustment and β_i is the matrix of cointegrating vector for the i^{th} unit.

4.3 Data

All data for the period 1990–2012 have been collected combining four different sources – (i) Ministry of Statistics and Programme Implementation (MOSPI), Government of India (GOI), (ii) Reserve Bank of India (RBI), (iii) Ministry of Labour and Employment (MOL&E), GOI and (iv) Census of India (COI), GOI. Besides, we used the Planning Commission poverty line (Rs. 49 for rural and Rs. 57 for urban at 1973-74 all-India-prices) originally defined by the Task Force on Projections of Minimum Needs and Effective Consumption Demand (GOI, 1979) and endorsed by Expert Group on Estimation of Number and Proportion of Poor (GOI, 1993). This usage is consistent with Datt and Ravallion (1998a, 1998b) methodology for India.

Data on monthly per capita expenditure (MPCE) have been collected using the various Rounds (45–68 except 65 and 67) of *National Sample Survey Office (NSSO)* and that on Gross State Domestic Product (GSDP) have been collected from the *National Accounts Statistics (NAS)*. Both NSSO and NAS are published by MOSPI. Population data have been collected using various Population Projection Reports published by COI. State-level deposits with scheduled commercial banks (SCBs) and development expenditure by state governments have been collected combining various issues of *Handbook of Statistics on Indian States (HBSIS)*, *Report on Currency and Finance* and *State Statistics and Finances* both published by RBI. Lastly, data on Consumer Price Index for Agricultural Labour (CPIAL) and Wholesale Price Index (WPI) have been collected from the various publications of MOL&E and splicing method has been used to obtain their corresponding 2011-12 equivalents. In order to capture the impacts at rural level and make the dataset free from inflationary effects, all data have been adjusted by CPIAL. WPI has been used to revise the rural poverty line at 1973-74 all-India-prices (Lakdawala Poverty line as used by Datt, 1997) to obtain its yearly values corresponding to 1990–2012.

Finally, we adopt a panel framework and therefore, data on MPCE have been collected from NSSO for the 13 major states (all states formed by 1960) in India. We omit all-states (except Uttarakhand) with Special Category Status (SCS) which includes Jammu and Kashmir, Ladakh, Himachal Pradesh and North-Eastern states. Besides, we considered the states of

Punjab and Haryana together as one state because they remained one until the Punjab Reorganisation Act, 1966. Among the Indian states, Bihar, Madhya Pradesh and Uttar Pradesh experienced a split into three new states – Jharkhand, Chhattisgarh and Uttarakhand (an SCS since 2001) respectively in 2000. Therefore, all data related to them from 2000-2012 have been augmented with their parent states to remain consistent throughout the observation snapshot.

The challenge is that no state-level MPCE round has been conducted by NSSO after 2012 (Round 68) and there was no MPCE survey during Round 65 (2008-09) and Round 67 (2010-11). Due to this, the span of the present chapter is restricted to 1990 till 2012.

The 9th Amendment of the Indian Constitution enacted in 1960 defines a benchmark in post-independence history of India from an administrative perspective. It provided a clarity to the extent of Parliamentary power of India. From this perspective, we identify all the states that were formed in India by 1960 as the 'major states'. These states have their own state legislatures and therefore could form their own state government and contribute to the federal structure of India. Therefore, the list of our 13 major states are as follows –

Table 4.1: List of 13 'major' states in India

Sr.	States	Sr.	States	Sr.	States
1.	Andhra Pradesh	6.	Madhya Pradesh	11.	Tamil Nadu
2.	Bihar	7.	Maharashtra	12.	Uttar Pradesh
3.	Gujarat	8.	Orissa	13.	West Bengal
4.	Karnataka	9.	Punjab-Haryana		
5.	Kerala	10.	Rajasthan		

Computation of Gini coefficient is based on Lorenz curve which captures all the information on the pattern of relative income-inequality. In literature, there are different functional forms related to the estimation of Lorenz curves. Among them – Beta Lorenz curve (Kakwani 1980) and General Quadratic (GQ) Lorenz curve (Villasenor & Arnold, 1989) are popular in practice.

Therefore, in order to obtain the continuous Gini-coefficients at the state level, we follow the Kakwani (1980) methodology as prescribed by Datt and Ravallion (1992) and utilised extensively in series of works by Datt (1997), Datt and Ravallion (1997, 1998a, 1998b), Datt et al. (2003, 2016) and Ravallion and Datt (1996, 2002). Moreover, Datt (1997) has utilised the same methodology to determine the state-level as well as country level Gini-coefficients of India for the period of 1951-1994. Although, coefficients at country level have been updated up to 2006 in Datt and Ravallion (2011) and up to 2012 in Datt et al. (2016), however, no such update was made at the state level. As such, we have to estimate it for all the 13 major states.

Following Datt and Ravallion (1992), the real building blocks of the methodology of estimating Lorenz curve is based on following two functional forms –

Lorenz curve: $L = L(p, \pi)$

and Poverty measure: $P = P\left(\frac{\mu}{z}, \pi\right)$

where, L is the share of the bottom p percent of the population in aggregate consumption, π is a vector of estimable parameters of the Lorenz curve, P is a poverty measure written as a function of the ratio of the mean consumption μ to the poverty line z and the parameters of the Lorenz curve.

Choice of parameterised Lorenz curve is based on the criterion of minimisation of the sum of squared error up to the head-count ratio. Applying this criterion, it has been observed that Beta

Lorenz performs better in minimising the error over GQ Lorenz curve. Since, our estimation procedure is based upon the suggestions from Datt and Ravallion (1992), we utilised the Beta Lorenz curve only. At the same time, Beta Lorenz curve has certain theoretical advantages over GQ Lorenz curve as it automatically satisfies the boundary conditions[3] required for a valid Lorenz curve (Datt and Ravallion 1992).

With the above considerations, the Beta Lorenz curve could be expressed as –

Equation of Beta Lorenz Curve: $L(p) = p - \theta p^{\gamma}(1-p)^{\delta}$

and its corresponding Gini coefficient: $2\theta B(1+\gamma, 1+\delta)$

where, θ is the coefficient to be estimated, γ and δ are parameters such that $\gamma, \delta \in (0,1)$ and $B(1+\gamma, 1+\delta)$ is the beta function represented as –

$$B(1+\gamma, 1+\delta) = \int_0^1 p^{\gamma}(1-p)^{\delta}\, dp \cdots\cdots\cdots\cdots (7)$$

The summary statistics of our variables runs as follows –

Table 4.2: Descriptive statistics of the variables

Variables	Obs.	Mean	SD	Median	Maximum	Minimum
LSG	273	2.3921524	0. 3128291	2.4291484	3.0956842	1.09023911
LPCSP	299	4.5839273	0. 4858075	4.5545113	5.7487571	3.53782148
FDEP	299	0. 3899016	0. 1642412	0. 3774051	1.2836681	0.14630913
DEVR	299	0. 2571558	0. 1936013	0. 2269139	1.2670928	0.00842421

Source: Author's calculation. Here, LSG =natural logarithm of state Gini, LPCSP = natural logarithm of per-capita state GDP (SGDP), FDEP = financial depth, DEVR = ratio of development expenditure; Obs. = total observation; SD =standard deviation.

[3]A theoretically valid Lorenz curve satisfies the following four conditions – (1) $L(0;\pi) = 0$, (2) $L(1;\pi) = 1$, (3) L' and (4) $L''(p;\pi) \geq 0$ for $p \in (0,1)$.

4.4 Results and Discussion

All estimation have been carried out using STATA version 14. Panel unit-root tests have been performed for all the variables using LLC, IPS and Hadri-LM tests. While LLC assumes homogeneity among the i cross-section units to conduct a t −test, IPS assumes heterogeneity among them to conduct a W–statistic test. Both tests consider unit root null against the alternative of no unit root with a slight distinction. LLC tests unit root to be a common process for all i while IPS tests it as an individual process for some i. Contrary to this, z −statistic based Lagrange Multiplier procedure of Hadri tests the null of stationarity across the i against the non-stationarity alternative. According to Choi (2006) combining tests of non-stationarity null with stationarity null improves reliability of test inferences when they corroborate with each other. We applied all the three tests (Table 4.3 and Table 4.4) and infer that all our variables are integrated of order one, I(1), i.e., non-stationary.

As mentioned earlier, cointegration test is sensitive to lag length. In our case, lag two selected by the standard SBIC and HQIC has been utilised throughout. At lag two, we apply the Pedroni (1999) and Kao (1999) procedure of testing the null of no cointegration under a panel set-up. Both the tests unanimously reject the null of no cointegration and point towards the existence of one cointegration relation among the variables at 5 percent level of significance. Table 4.5 reports the cointegration test results and Table 4.6 reports the corresponding cointegration vector. Since our primary objective is to capture the impact of financial development on Gini-coefficients ($LSG_{i,t}$), all variables have been normalised with respect to $LSG_{i,t}$.

It is evident from Table 4.6 that $FDEP_{i,t}$ enters into the cointegration equation with a positive impact on the growth in income-inequality ($LSG_{i,t}$) while $LPCSP_{i,t}$ and $DEVR_{i,t}$ enters with negative impact. Econometrically, cointegration vector represents the long-run equilibrium relationship between the variables. However, in short run, it is quite natural to have deviations from such equilibrium.. Thus, in our case, Table 4.6 shows that to a deviation in $LSG_{i,t}$ from its long-run equilibrium, $FDEP_{i,t}$ will move in the same direction of $LSG_{i,t}$ while $LPCSP_{i,t}$ and $DEVR_{i,t}$ will move in the opposite direction. Notably, cointegration implies that such movements, as a whole would help $LSG_{i,t}$ in returning to its long-run equilibrium eventually. The convergence back to the equilibrium or correction of the error due to deviation in short-run, however, depends on the adjustment coefficients, i.e., coefficients of the ECT term in VECM estimate (Table 4.7).

We observe from Table 4.7 that except developmental expenditure ($DEVR_{i,t}$), no other variable has a consistent negative impact on the growth in income-inequality ($LSG_{i,t}$) at the state level. The table also shows that the impact of both $LPCSP_{i,t}$ and $FDEP_{i,t}$ on $LSG_{i,t}$ is negative in first period but positive in second period. Thus, both $LPCSP_{i,t}$ and $FDEP_{i,t}$ reduces the income-inequality initially but increases the same in subsequent periods. Since, the net impact of growth in per-capita SGDP on the growth of income-inequality is positive, we conclude that per-capita SGDP (per-capita state income) growth aggravates inequality in income. The net impact of financial deepening, on the contrary, is inequality reducing to some extent.

In presence of penetration (1:4 bank licensing policy of 1977) of the banking sector, policies committed to boost the credit accessibility and availability, have made more funds available to the rural sector by reducing the lending rates. However, as pointed out by Banerjee and Duflo (2014), such benefits have been accrued by the more credit worthy peers in subsequent periods at the cost of the ones requiring those funds. Due to such unintended discrimination, there exists an uneven distribution within the priority sector lending as well. However, it could not be ignored that such initial boost has helped in increasing the credit availability. Therefore, despite an increase in inequality due to discriminatory credit allocation and financial market imperfections, benefits flowing from the initial better-offs could not be exhausted altogether. Therefore, we conclude that there is difference between the net impact of economic growth (positive) and financial deepening (negative) on income-inequality of the major states in India.

The fact that the lagged values of one variable enters into the error-correction equation of the others, tempt us to check for the Granger causality (Table 4.8) among the variables by testing the null of non-causality. Granger causality implies that if x causes y then it means that the past values of x help in explaining the y.

From Table 4.8, we observe that there runs a unidirectional causality from $LPCSP_{i,t}$ to $LSG_{i,t}$ and $FDEP_{i,t}$. This implies that growth of per-capita state income in past helps in explaining the growth in inequality and financial depth at present. Bi-directional causality, however, has been observed to run from $LSG_{i,t}$ to $DEVR_{i,t}$ and $FDEP_{i,t}$ and from $FDEP_{i,t}$ to $DEVR_{i,t}$. From this perspective, we could say that it is the inequality experience of a state that drives the amount of financial deepening, developmental expenditure by government for that state and vice-versa.

It is understood that income-inequality would impact savings and consequently the deposits and therefore, would invariably impact the financial deepening. Depth on the other hand, could impact inequality through the channels of – (i) credit availability and (ii) economic growth which it causes. From the perspective of government, how much it would spend for the development of a state depends largely on the standard of living (here, inequality) of that state. Thus, states with higher inequality would have more of such allocation for them and vice-versa. Further, we have observed that there is non-existence of any causal relationship between $LPCSP_{i,t}$ and $DEVR_{i,t}$.

Table 4.3: Result of unit-root tests (at level)

		LLC Test Results ($t-$ Statistic)				IPS Test Results (W− Statistic)				Hadri-LM Test Results (Z− Statistic)			
Series	**NoC**	**NoS**	**Test Result**	**P-values**	**Test Type**	**NoS**	**Test Result**	**P-values**	**Test Type**	**NoS**	**Test Result**	**P-values**	**Test Type**
LSG	13	273	2.9495	0.9984	Int, T, L=2	273	-0.6908	0.2449	Int, T, L=2	273	3.0273*	0.0012	Int, T, L=2
$FDEP$	13	299	2.3182	0.9898		299	0.0216	0.5086		299	9.5408*	0.0000	
$LPCSP$	13	299	-2.1569	0.0155		299	-1.9722	0.0243		299	7.7443*	0.0000	
$DEVR$	13	299	2.8093	0.9975		299	-0.5294	0.2983		299	7.3228*	0.0000	

*Source: Author's calculation. Here, *, **, *** corresponds to rejection of null hypothesis at significance level of 5%, 1% and 10% respectively . Int = intercept, T = time trend, L = number of optimal lags for the variables in test equation. Here, NoC = number of cross-sections, NoS = number of observations. Finally, P-value = probability value of committing Type-I error, i.e., the probability of rejecting the null when it is true.*

Table 4.4: Result of unit-root tests (at first difference)

		LLC Test Results ($t-$ Statistic)				IPS Test Results (W$-$ Statistic)				Hadri-LM Test Results (Z$-$ Statistic)			
Series	**NoC**	**NoS**	**Test Result**	**P-values**	**Test Type**	**NoS**	**Test Result**	**P-values**	**Test Type**	**NoS**	**Test Result**	**P-values**	**Test Type**
ΔLSG	13	234	-8.4368*	0.0000	Int, T, L=2	234	-4.6189*	0.0000	Int, T, L=2	234	1.6099***	0.0537	Int, T, L=2
$\Delta FDEP$	13	286	-8.6896*	0.0000		286	-10.870*	0.0000		286	2.2084*	0.0136	
$\Delta LPCSP$	13	286	-10.255*	0.0000		286	-12.226*	0.0000		286	2.1007*	0.0178	
$\Delta DEVR$	13	286	-4.2824*	0.0000		286	-10.460*	0.0000		286	-0.9083	0.8181	

*Source: Author's calculation. Here, *, **, *** corresponds to rejection of null hypothesis at significance level of 5%, 1% and 10% respectively . Int = intercept, T = time trend, L = number of optimal lags for the variables in test equation. Here, NoC = number of cross-sections, NoS = number of observations. Finally, P-value = probability value of committing Type-I error, i.e., the probability of rejecting the null when it is true.*

Table 4.5: Result of cointegration tests (Pedroni and Kao)

Test Type	Test Statistic	Test Result	P-value
Pedroni (1999) Cointegration Test	Panel v-statistic	1.927643*	0.0269
	Panel ρ-statistic	-6.133692*	0.0000
	Panel PP-statistic	-18.24035*	0.0000
	Panel ADF-statistic	0.251987	0.5995
	Group ρ-statistic	-4.814222	0.5995
	Group PP-statistic	-19.40796*	0.0000
	Group ADF-statistic	1.272967*	0.0000
Kao (1999) Cointegration Test	Kao ADF-statistic	-2.505888*	0.0061

*Source: Author's calculation. Here, *, **, *** corresponds to rejection of null hypothesis at significance level of 5%, 1% and 10% respectively*

Finally, P-value = probability value of committing Type-I error, i.e., the probability of rejecting the null when it is true.

Table 4.6: Cointegration vector

LSG ($LSG_{i,t-1}$)	**FDEP** ($FDEP_{i,t-1}$)	**LPCSP** ($LPCSP_{i,t-1}$)	**DEVR** ($DEVR_{i,t-1}$)	**Constant**
1.0000	-12.225	3.457*	5.021	-22.153
	(3.9379)	(0.9430)	(2.9666)	

*Source: Author's calculation. Standard error in parentheses. Here, *, **, *** corresponds to rejection of null hypothesis at significance level of 5%, 1% and 10% respectively*

Table 4.7: Result of error-correction estimates

Explanatory Variable	Dependant Variables			
	$\Delta LSG_{i,t}$	$\Delta FDEP_{i,t}$	$\Delta LPCSP_{i,t}$	$\Delta DEVR_{i,t}$
ECT_{t-1}	-0.6100*	-0.0005	-0.0065**	-0.0014
	(0.1045)	(0.0006)	(0.0021)	(0.0009)
$\Delta LSG_{i,t-1}$	-0.3875*	0.0004	0.0061**	0.0015***
	(0.0935)	(0.0007)	(0.0018)	(0.0008)
$\Delta LSG_{i,t-2}$	-0.1772*	0.0002	0.0033*	0.0014*
	(0.0691)	(0.0005)	(0.0014)	(0.0006)
$\Delta FDEP_{i,t-1}$	-1.5457	0.2647*	-0.0866	0.6950**
	(9.8131)	(0.0674)	(0.1840)	(0.0833)
$\Delta FDEP_{i,t-2}$	-6.3902	-0.1365*	-0.1831	0.2653**
	(8.6239)	(0.0624)	(0.1705)	(0.0772)
$\Delta LPCSP_{i,t-1}$	-4.6311	-0.2017*	-0.0962	-0.0206
	(3.5612)	(0.0261)	(0.0712)	(0.0322)
$\Delta LPCSP_{i,t-2}$	2.2696	0.0695*	-0.0128	0.1604**
	(4.0174)	(0.0286)	(0.0781)	(0.0353)
$\Delta DEVR_{i,t-1}$	-6.5389	0.1487**	-0.1058	0.0024
	(7.1493)	(0.0510)	(0.1392)	(0.0630)
$\Delta DEVR_{i,t-2}$	-11.4409***	-0.0418	0.0822	-0.0779
	(6.7543)	(0.0489)	(0.1335)	(0.0604)
$\mu_{i,t}$	0.3044	0.0210**	0.0524*	-0.0121**
	(0.3945)	(0.0028)	(0.0078)	(0.0035)
R^2	0.5377	0.3082	0.0692	0.3789

*Source: Author's calculation. Standard error in parentheses. Here, *, **, *** corresponds to rejection of null hypothesis at significance level of 5%, 1% and 10% respectively . Here, Error Correction Term ECT_{t-1},.*

Table 4.8: Result of pair-wise Granger causality test

Causality	NoS	Test Result ($F-$statistic)	P-value	Causality	NoS	Test Result ($F-$statistic)	P-value
$FDEP \rightarrow LSG$	273	9.9514	0.0000*	$LPCSP \rightarrow FDEP$	273	46.1308	0.0000*
$LSG \rightarrow FDEP$	273	3.4356	0.0336*	$FDEP \rightarrow LPCSP$	273	1.5276	0.2190
$LPCSP \rightarrow LSG$	273	8.8251	0.0002*	$DEVR \rightarrow FDEP$	273	3.3392	0.0369*
$LSG \rightarrow LPCSP$	273	1.8503	0.1592	$FDEP \rightarrow DEVR$	273	28.487	0.0000*
$DEVR \rightarrow LSG$	273	5.7338	0.0036*	$DEVR \rightarrow LPCSP$	273	0.1469	0.8634
$LSG \rightarrow DEVR$	273	9.7956	0.0000*	$LPCSP \rightarrow DEVR$	273	0.8089	0.4464

*Source: Author's calculation. Here, *, **, *** corresponds to rejection of null hypothesis at significance level of 5%, 1% and 10% respectively .*

Here, P-value = probability value of committing Type-I error, i.e., the probability of rejecting the null when it is true.

Finally, the observation that the net impact of growth in per-capita SGDP aggravates income-inequality has been well discussed in Deaton and Dreze (2002), Banerjee and Piketty (2005), Basu (2006)[4] and Basu and Mallick (2008) amongst others. It has been argued that the benefits of liberalisation, has enlarged the income inequality by benefiting only a richest few (Banerjee & Piketty, 2005) and a small group of middle-class people. In absence of 'trickle-down' in its actual sense, Deaton and Dreze (2002) observes that the income-inequality not only increased between the states, their respective rural and urban sectors but also within the urban sectors. They have been repeatedly referring to the nineties as the era of increasing income-gap.

For India, Banerjee and Duflo (2014) as well as Das and Guha Khasnobis (2008) observe the existence of credit constraint, transaction cost of lending, competitive declining credit for the agricultural and rural sectors at the cost of firms and service sectors. Sectors that were in dire need of credit, failed to access it because they did not have enough capacity to demonstrate their credit worthiness or were once eligible but lost their status due to change in policies.

The skewness created via uneven growth experience were further aggravated by corresponding financial reforms, sometimes a lack thereof. As such, total deposits and corresponding financial deepening failed to cater itself to the target pockets of income-inequality. Also, Basu (2006)[5] and Datta and Singh (2019) have observed that the poor and weaker classes of people often face difficulties in opening bank accounts because of the distance of bank branches from their habitats, their difficulty in dealing with banking officials as the marginalised often have poor literacy and meagre savings capacity, and their inability to offer adequate collateral against loan applications. Thus, the access of poor borrowers to formal credit is effectively cut off, and they

[4] This refers to Basu, K. (2006).
[5] This refers to Basu, P. (2006).

end up borrowing at much higher rates from the informal sources like local moneylenders etc.

However, the penetration and reach actually ended up helping the government led priority-lending and other subsidies to reach the remote rural areas in case of certain states, usually the ones with better human development indicators (for e.g., Kerala). Therefore, the experience is also not uniform across the states. The reason as identified in Banerjee and Duflo (2014) is that the banks allocate (as mandate) a fixed amount of capital as 'priority sector' lending for the beneficiaries eligible for it. Therefore, in a competitive framework, banks seek to choose the obligor most conducive to the banking business. Given the dominance of the SCBs, regulatory mandates, financial market imperfections and non-uniform rates of human development across the states, skewness in credit allocation, although not intended, could not be escaped either.

4.5 Conclusion

The present chapter has examined the impact of financial sector development on the change in income inequality for 13 major states in India during the liberalisation and post-liberalisation periods from 1990 to 2012. Such an impact has been assessed in an environment characterised with growth in per-capita state income and development expenditure incurred by the state government. Both these factors are widely considered to cause a reduction in income inequality.

Present chapter is restricted to only one activity of the financial sector – banking intermediation through SCBs and used the standard measure of financial depth as the proxy of its size. We have also used the increase in per-capita state income as the proxy for economic growth at the state level. From this, we find evidence to favour the 'Robinsonian view' that financial development follows income growth during the liberalisation and post-liberalisation years at least for the major states in India.

Additionally, we find evidence that the formal financial intermediation has helped in reducing the income inequality to some extent but economic growth did not. Rather, it has aggravated it. At the state level, this observation is consistent with the reality that the income-distribution is not uniform but skewed in India and lower-income groups experienced poor access to formal banking, at least during the period of our study. Therefore, in presence of financial market imperfections, banking sector could not perform as desired despite having penetration due to licensing policy.

From the observation that financial deepening could explain the developmental expenditure of the state governments, it could be concluded that there is a strong possibility that the financial penetration has contributed in channelising developmental expenditure in reaching the remote areas, poors and disadvantaged ones. It is strengthened by the observation that such expenditures from government has actually helped in reducing the income inequality.

As no causality runs from per-capita income growth to the developmental expenditure of the state governments, we conclude that the expenditures undertaken by respective state governments are not primarily driven by the level of economic growth that the state is experiencing. Such initiatives on the part of the state government usually have the sole purpose of accelerating inclusive social development and providing infrastructural impetus to the economic growth.

Finally, based upon the long run relationship between the variables for 13 major states in India, we conclude that it is the cumulative environment of financial development, economic growth and development expenditure which impacts the change in income inequality at the state level.

Further, it is well-known in context of India that the increase in economic growth during the post-liberalisation period has been majorly driven by the service-sector boom and is not an experience that happened across all the sectors. For e.g., agriculture suffered by being subjected to competition and for industry, the benefits although positive has not been enormously so.

Chapter – 5

Conclusion

Through the previous chapters, present thesis attempted to empirically explore the importance of the development in financial sector for the growth in real sector, i.e., output in India. Considering the benchmarking phases of financial sector – post-republic period (Chapter 2), post-nationalisation period (Chapter 3) and both liberalisation and post-liberalisation period (Chapter 4), we have tried to systematically establish some of the major implications of financial intermediation for the Indian economy. In paragraphs that follow, we summarise the major findings of our chapters and scope for further research.

In context of the emerging economy – India, Chapter 2 establishes the 'finance-growth' nexus in presence of private and public sector investments (gross fixed capital formation) by considering the post-republic years of 1951–2017. In this process, we have observed strong evidence in favour of Schumpeterian view that a bank-based financial system induces long-term growth in the real sector.

Additionally, we assessed two propositions – (i) financial deepening has strong impact on the growth process and (ii) measures of financial activity rather than size of the sector plays more significant role in the growth process. The assessment indicates that financial deepening has strong unidirectional impact on the long-run growth process and both activity and size of the financial sector (here, financial intermediation) matters, at least, in case of India.

Financial intermediaries, however, does not take part directly in the growth process. In this regard, public and private gross fixed investments could be viewed as channels through which financial activity gets transmitted to the economy. Present thesis indicates that private investments of such kind are yet to be significant for the Indian economy and in long-run public sector activities dominates.

Chapter 3 examines the post-nationalisation years of 1972–2019 and establishes that the growth of bank finance in the form of sectoral credit allocation does provide positive impact on real sector growth. This could also be viewed as an additional channel through which 'finance-growth' nexus is materialising at an aggregate level. The transmission initially begins in the form of credit allocation to different sectors. As a result, level of sectoral output increases and finally gets culminated in the form of aggregate output of the economy.

We have also observed that there is an increase in total credit allocation for all sectors of the economy. However, such an increase in bank-credit allocation has 'less-than desired' impact for the growth of industrial sector, whereas for the growth of agriculture sector and 'trade and transport' sub-sector of the service sector, it provides positive impact. Besides, we have observed that such sectoral credit allocation to any one sector impacts the output of other sectors as well. This establishes the significance of financial intermediation in explaining and governing the sectoral interlinkages.

This far, we have been able to establish the positive ramification of financial intermediation on long run economic growth, sectoral output, their interlinkages and the various channels of investment and credit allocation through which it manifests. Therefore, in Chapter 4, we intended to investigate whether such an impactful and intricately significant financial intermediation also helped in reducing the income inequality at the state level of India or not. For this purpose, the dynamics of income inequality and financial deepening during the liberalisation and the post-liberalisation years of 1990–2012, have been examined for 13 'major states' in India. The investigation has been carried out considering an environment of per-capita state income and developmental expenditure incurred by the respective state governments.

Considering banking intermediation through scheduled commercial banks (SCBs) and the standard measure of financial depth, we observe, as a whole, that financial intermediation has helped in reducing the income inequality while economic growth did not. Rather, aggravated it. Besides, we observe that growth causes financial development at the state level of India during the liberalisation and post-liberalisation phases. This provides a strong evidence in favour of 'Robinsonian view' that finance follows growth. However, the observation that financial deepening could explain the developmental expenditure of the state governments, indicates that the financial penetration (particularly, of public sector banks) has contributed in channelising the developmental expenditure to the remote areas, poors and disadvantaged ones of those states. This has further been strengthened by the observation that developmental expenditures from the state government has helped in reducing the income inequality.

Also, non-causality between real growth at the state level and the state government led developmental expenditure indicates that the developmental decisions taken by government are independent of the level of economic growth which the state is experiencing. Additionally, we have evidenced that the financial development, per-capita income growth and development expenditure bears long term implication for the change in income inequality at the state level.

Additionally, income-distribution is not uniform but skewed in India and lower-income groups have poor access to formal banking, at least, during the period of our study. They are more exposed to informal credits than formal ones due to various regulatory restrictions, awareness, distance to bank, time cost etc. Thus, coupled with financial market imperfections, banking sector could not perform as desired despite having penetration into the rural areas.

At closure, we accept that it always remains beyond the scope of any research work to explore all the areas and cover all the issues related to the topic of research. The same is true in our case as well. Despite we tried to answer, three unexplored questions in context of 'finance-growth' nexus in India, however, a lot still remains unanswered. In one way, those are the limitations of the present thesis. To put it differently, those are the scope for further researches in context of interrelationship between the two sectors – 'financial and real'.

The framework in Chapter 2 fails to explain why and how the interlinkage between financial intermediation and growth behaved differently during the policy periods and despite such difference what mechanism governed the unidirectional causality from financial sector to real sector in long-run. Another important limitation is non-consideration of plenty of other highly correlated (like savings, interest rates, term structure, legal framework, credit availability, firm structure, trade etc.) domestic and international factors detrimental to the 'finance-growth' interlinkage. Whether financial crisis, changing of political regimes, corporate structure etc. has any explanatory significance or not remains unexplored. Present thesis is limited to financial intermediation through banking sector only. Therefore, non-consideration of the informal mode of credit availability, non-banking financial institutions, microfinance, stock and bond markets, asset market etc. also accounts for the limitation of the present thesis.

The framework in Chapter 3 asks for consideration of alternative frameworks in exploring the transmission mechanism of sectoral credit allocation from financial intermediaries. However, its limitations lie in non-consideration of the complexities associated with the interest rates, reserve requirements, number of available accounts, financial penetration generated through the establishment of banking branches etc. incorporation of such complexities could led into the permutation of alternative approaches in dissecting this topic and therefore, could be viewed as areas of further research in this context.

Finally Chapter 4 has limitations in explaining whether the lack of formal banking access paved the path for introduction of financial inclusion measure (say, Jan-Dhan-Yojana in 2014) or not and therefore calls for further research in line with this understanding. At the same time it was beyond the scope of present thesis and therefore, left unexplained that how the initial interaction of 'growth following finance' between the real and financial sector at the national level transpired into 'finance following growth' interaction at the state level. The underlying structural shift could be an interesting field for further exploration as well. Besides, we have considered only one measure of financial development – financial depth and only one activity of the financial sector – financial intermediation via SCBs, however, there are other measures and activities left out of consideration in present thesis. Assessment of their various combinations and impact of such combinations on income-inequality could be another strand for future exploration. Present thesis could not explore expenditure or implication of any other inequality reducing initiative of the state government which is a limitation. Another limitation could be non-consideration of highly correlated (like savings, interest rates, term structure, legal framework, credit availability, firm structure, trade etc.) state-specific and inter-state factors detrimental to the interlinkage of financial sector and state level income inequality.

There are several other likewise issues that could be attributed as limitation of the present thesis. All such issues, however, open avenues for further investigation and could be explored to extract important insights about the dynamics of 'finance-growth' nexus.

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