Summary of the Ph.D. Dissertation

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Content

1. Introduction and literature

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 purposes 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 of information asymmetry regarding returns of an investment project, lending to entrepreneurs require both ex–ante evaluation and ex post monitoring of such projects. These in turn demands specific set of skill as well as cost which appear both unrealistic and prohibitive for an individual investor to carry them out on his own. Banks, instead could exploit the law of large numbers in forecasting the unsuccessful projects and the returns thereof and hence are far more efficient in conducting such 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 on mobilising savings into investment projects (Diamond & Dybvig, 1983). The above implies that for the risk–averse households, holding savings in the form of bank deposits ensure safer returns, however, lower than their more volatile as well as unsafe counterparts – higher return equities. In this spirit, banks and other financial intermediaries are conducive of real sector growth in the long run. Such contribution in causing the real sector growth becomes highly instrumental in case of developing and underdeveloped economies.

Literature around the various (legal, political, regulatory, policy etc.) linkages between 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, economists disagree sharply about the role of the financial sector in economic growth. One school of thoughts hold Schumpeter (1912) that 'growth follows finance' (Schumpeterian view) while the other hold Robinson (1952) that 'finance follows growth' (Robinsonian view). This disagreement, over the period of time, have engaged economists in collecting evidence to favour one view above the other. In turn, this has resulted into several studies (both theoretical and empirical) concerning various implications and manifestations of 'finance–growth' nexus.

In this backdrop, present thesis empirically investigates the interaction between the financial development and economic growth and proposes 'three chapters' to identify, in sequence, whether and how such interrelation manifests for an economy. It also considers implication of such interconnection on 'industry of origin' (agriculture, industry and service) as well as on the standard of living. From this perspective, present thesis is an economy–specific study, i.e., a case study of an emerging economy called India.

Indian economy presents a unique case because from an underdeveloped economy she evolved into an emerging economy within 65 years of independence. In doing so, she surpassed the popular Clark–Fischer theory of growth and exists as a mixed economy where both private and public sector co–exist as well as participate in economic growth under the general guidance of economic planning. Further, unlike other emerging economies, Indian financial sector and monetary policy framework remained a key component of the overall reforms which provided the foundation for achieving increased price and financial stability. Reforms in these sectors have been well–sequenced, gradual, cautious, and steady in process, devoid of fluctuations that could be observed in other countries given the state of the markets in various segments.

2. Research questions

In years following Demetriades and Luintel (1996), several studies have been carried out concerning the direction, determinants, functioning and effectiveness of the relationship between financial intermediation or financial development and economic growth of the Indian economy. Some of the pioneering studies are – Singh (1997), Burges and Pande (2005), Das and Guha-Khasnobis (2008), Singh (2008), Chakraborty (2010), Ang (2010), Pradhan (2010), Dal Colle (2011), Bhanumurthy and Singh (2013), Kar and Mandal (2014), Banerjee and Duflo (2014), Anwar (2015), Das et al. (2018), Fukuda (2018) amongst others.

However, we observed that none of these studies adequately address the questions of –

(i) How such an interdependence between financial and real sector has emerged through the major phases of banking sector reforms?

(ii) What is the mechanism through which financial sector influences the real output at an aggregate level?

(iii) Whether financial sector plays any role at all in explaining the dynamics of inter–sectoral linkages or not?

(iv) Who benefits from this interaction, i.e., the role of such ‘interdependence’ between the financial sector and economic growth in impacting the income inequalities across the ‘major states’ (all the states established by 1960) in India?

Therefore, present thesis made an attempt to answer them in sequence through its ‘three chapters’. While Chapter 2 answers the question no. (i), Chapter 3 answers (ii) and (iii) and finally Chapter 4 addresses the question no. (iv).

3. Econometric Model

Our approach is primarily based on the application of linear vector autoregression (VAR) technique as suggested by Sims (1980, 1986) in context of time-series and later developed by Holtz-Eakin et al. (1988) and Binder et al. (2005) in context of panel-series. Therefore, in present thesis, VAR has been applied in context of time–series (Arestis & Demetriades, 1997) in Chapter 2 and Chapter 3 and in context of panel–series (Christopoulos & Tsionas, 2004) in Chapter 4.

The estimation procedure adopted in all three chapters could be summarised as follows –

Step 1: Application of VAR requires selection of optimal lag-length. However, among the lag selection criterions available in literature, in all chapters, we selected the optimal lag chosen by Schwartz Bayesian Information Criteria (SBIC). Generally, SBIC has theoretical advantage over Akaike Information Criteria (AIC) in providing consistent estimate of the true lag order because minimising AIC could overestimate the true lag order with positive probability (Lütkepohl, 2005).

Step 2: As testing procedure, we begin by testing the stationarity of our system variables. The approach, however, is different for time-series (Chapter 2 and Chapter 3) and for panel-series (Chapter 4).

(a) ***Stationarity test for time-series***

In Chapter 2 and Chapter 3 we apply the standard unit root tests – augmented Dickey–Fuller test (ADF test) due to Said and Dickey (1984), Phillips–Perron test (PP test) due to Phillips and Perron (1988) and Dickey–Fuller generalised least square test (DF–GLS test) due to Elliot et al. (1996). All these three tests, 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 unit root in case of time–series.

However, in presence of structural break, unit-root tests (in time-series), are biased towards their unit–root null. Therefore, in Chapter 2, we conducted the Bai-Perron (1998) multiple break point test (Table A.1) to detect the number of breaks. Subsequently, Banerjee, Lumsdaine and Stock (1992) test or BLS test has been applied to test the presence of unit–root irrespective of break. In case of Chapter 3, all tests indicate that our variables are stationary in nature.

(b) ***Stationarity test for panel-series***

For panel–series in Chapter 4, we assume the independence across i (the cross-section unit) on basis of Quah (1994) and apply $t - test$ based Levin, Lin and Chu (2002), $W -$ statistic based Im et al. (2003) and $z -$ statistic based Hadri (2000) panel unit root tests as practised in literature and call them LLC, IPS and Hadri-LM tests.

It has been observed, that all our variables in Chapter 2 and Chapter 4 are non-stationary while those in Chapter 3 are stationary.

Step 3: In context of VAR, if non-stationarity is detected, then such variables might remain cointegrated with each other (Engle & Granger, 1987). This calls for the testing of cointegration – (i) Johansen cointegration test (Johansen, 1988) in case of time–series (Chapter 2) and (ii) Pedroni (1999) and Kao (1999) cointegration test in case of panel–series (Chapter 4).

However, when variables are stationary, it is imperative to identify their error structure. For this purpose, we have utilised structural VAR in Chapter 3.

Step 4: Existence of cointegration implies incorporation of error-correction term in VAR and the resulting model is known as – vector error-correction model (VECM) in context of time-series whose panel counterpart is panel vector error-correction model (PVECM).

To capture the impacts of various phases in Chapter 2, we incorporated two time dummies – (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.

Step 5: The final step is to obtain the impulse response functions (IRFs) and decomposition of variance in forecast error (FEVD) of the system variables h–step ahead. Such things are not applicable given the context in which we utilise panel–series in Chapter 4.

4. Data

For the present thesis, all data for Chapter 2 and Chapter 3 have been collected by combining *National Accounts Statistics (NAS)* published by the Ministry of Statistics and Programme Implementation (MOSPI), Government of India (GOI) and *Database on Indian Economy (DBIE)* published by Reserve Bank of India (RBI). In case of Chapter 4, few additional sources – Ministry of Labour and Employment (MOL&E), GOI and Census of India (COI), GOI have been used.

From RBI, we used various issues of *Handbook of Indian Economy (HBIE)*, *Basic Statistical Returns (BSR)*, *Handbook of Statistics on Indian States (HBSIS)*, *Report on Currency and Finance* and *State Statistics and Finances* published by RBI. Population data has been collected using various Population Projection Reports published by COI. 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 used splicing method to get their 2011-12 equivalents. Thus, all our variables are free from fluctuations due to inflation. Lastly, data on monthly per-capita consumption expenditure (MPCE) have been collected combining the various rounds (Round 45–68, except 65 and 67) of National Sample Survey Organisation (NSSO), MOSPI.

In case of Chapter 4, 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 our chapter is restricted from 1990 to 2012. Further, there is no authentic source that could provide continuous estimates of Gini-coefficients at the state-level of India. For this purpose, we have utilised the methodology of Beta Lorenz curve discussed in Datt-Ravallion (1992) and estimated the Gini-coefficients from MPCE data.

5. Chapter outline and Contribution

With Chapter 1 constituting the 'introduction' and Chapter 5 highlighting the 'conclusion', we provide a brief summary of the remaining chapters in subsequent sections.

Chapter 2 contributes its uniqueness by discussing how the interdependence between financial and real sector has emerged through the major phases of banking sector reforms. Also, it offers an alternative framework of considering the public and private sector investments in investigating the 'finance–growth' nexus for developing economies. The dynamics of this relationship has been studied over the periods – prior to Nationalisation in 1969, between Nationalisation and Liberalisation in 1991 and during post–Liberalisation years and find evidence favouring 'Schumpeterian view'. Using the time–series methodology, this chapter studied data on Indian economy from 1951 to 2017 and uses impulse response of the variables to understand the effect. It finds that for economic growth, 'nationalisation' has negative impact while 'liberalisation' impacts it positively.

Chapter 3 attempts to answer another exclusive question – what is the mechanism through which financial sector influences the real output at an aggregate level. It also explores whether financial sector plays any role at all in explaining the dynamics of inter–sectoral linkages or not. Applying the usual time–series techniques of unit–root tests and structural vector autoregression (structural–VAR) methodology, we observe that in case of India, during the period from 1972–2019, growth of banking–finance in the form of sectoral credit allocation provided a positive impact on real growth of that sector and others. This could be viewed as a channel through which the 'finance–growth' nexus materialises itself at an aggregate level of the economy. The transmission initially begins as credit allocation to 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. Thus financial intermediaries plays an important role in explaining the inter–sectoral linkage as well.

Finally, in Chapter 4 another distinct attempt has been made to investigate the role of 'interdependence' between the financial sector and economic growth in impacting the income inequalities across the 13 major states of India. For this purpose, state–level Gini coefficients for 13 major states, over the period of 1990–2012, have been computed following Datt and Ravallion (1992) methodology of Beta Lorenz curve. The unique contributions of this chapter lies as the first attempts in – (i) investigation of finance–growth–inequality at the state level,

(iii) constructing a combined environment of growth and 'trickle–down' (through per–capita income), government initiative (through development expenditure of state government) and size and access to formal banking (through financial depth) and (iii) application of Datt-Ravallion (1992) methods in finance-growth literature. To such an environment, we apply the usual techniques of panel vector autoregression (PVAR) and observe that financial sector has helped in reducing the income inequality, while economic growth has enhanced it for the states.

6. Major findings

We have attempted to systematically establish some of the major implications of financial intermediation for the Indian economy.

For brevity, we present a brief overview of our variables and discuss the major implications of our results here. All figures and calculations have been provided in the Appendix under A (Main results of Chapter 2), B (Main results of Chapter 3) and C (Main results of Chapter 4). All estimations have been carried out using STATA version 14.

	Variables Studied
Chapter 2	LY = Natural logarithm of per-capita GDP at period t.
(Time-series)	FD = Ratio of deposits (demand + time) to lagged GDP at period t.
	PR = Ratio of fixed capital formation by private sector to GDP at period t.
Span:	PB = Ratio of fixed capital formation by public sector to GDP at period t.
1951–2017	(1) $NAT = 1$ (year $>$ 1969) else 0 and (2) $LIB = 1$ (year $>$ 1991) else 0.
Chapter 3	SVA = Natural logarithm of gross value-added by k^{th} sector at period t.
(Time-series)	$CRED$ = Ratio of bank credit to gross value-added by k^{th} sector at t.
Span:	PB = Ratio of public investment to gross value-added by k^{th} sector at t
1972–2019	$k \Rightarrow$ Agriculture, Industry, Sub-sector of service (trade and transport)
Chapter 4	LSG = Natural logarithm of state Gini of k^{th} state at period t.
(Panel-series)	$LPCSP$ = Natural logarithm of per-capita state GDP of k^{th} state at period t.
	$FDEP$ = Ratio of deposits (demand + time) to lagged GDP of k^{th} state at t.
Span:	$DEVR$ = Ratio of development expenditure per unit GDP of k^{th} state at t.
1990–2012	$k \Rightarrow$ 13 major states in India (list in Table C.1)

All variables in Chapter 2 and Chapter 4 are non-stationary and are cointegrated with one cointegration relation whereas all variables in Chapter 3 are stationary. This could be observed from the trend in variables captured by Figure A.1 and Figure B.1 in Appendix.

For Chapter 2, we observe from Table A.2 that the NAT estimate with negative coefficient for LY_t implies that the period of nationalisation with its various restrictions has hurt the economic growth which was overcome during the liberalisation (LIB). Also, it is evident that every sector has benefitted from 'liberalisation' except the public gross fixed capital formation (PB_t). This is natural because liberalisation in 1991 came hand in hand with 'privatisation' and government had to withdraw from investing into various undertakings. Notably, LIB has benefitted the financial sector (FD_t), however, marginally. 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 has benefitted from the withdrawal of government intervention via liberalisation.

The impulses obtained from VECM (Figure A.2) do not necessarily taper off to zero because they are not temporary but permanent. All of the adjustments are taking place within a 10 years period implying existence of 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 on real sector growth. For FD_t, a one percent change in real and public sector investment via fixed capital formation has positive impact. A decreasing effect, however, positive could be observed in response of FD_t to a PR_t shock and vice–versa.

Table A.3 captures the forecast error decomposition of the variables at a horizon of 1–30 years. To obtain the decomposition, we allowed the shocks to systematically enter the system as $PB \rightarrow FD \rightarrow PR \rightarrow LY$. The importance of financial sector could invariably be observed in our system. From only 20 percent at shorter horizon (4–5 years) it explains more than 30 percent of the variation in real sector at a longer horizon of 20 years indicating long term dependency of the real sector growth on financial sector. Also variation in private investment depends largely on the financial sector. However, real sector, having a unidirectional long term dependency on financial sector. This favours the 'Schumpeterian view' that finance causes growth for the Indian economy.

Chapter 3 examines the post-nationalisation years of 1972–2019 and establishes that the growth in banking-finance in the form of sectoral credit allocation does provide positive impact on real sector growth. The transmission initially begins in the form of credit allocation to different sectors. Since all our variables are stationary and our interest lies in obtaining their corresponding impulse responses and forecast error decomposition, we resort to structural VAR. To obtain the structural-form errors from reduced-form errors (Table B.1), we utilise the B–model discussed in Lütkepohl (2005) and impose structural restrictions on basis of the following assumptions –

(a) Public sector investment and bank credit for any sector impacts output of that sector only.
(b) Sectoral interlinkage at the level of output implies sector–specific credit impacts output of that sector directly and of the other sectors indirectly.
(c) Credit allocation decision by commercial banks (as financial intermediaries) and the expenditure decisions undertaken by the government (central and state) for capital formation by providing infrastructure and other sectoral facilities (say, construction of roads, etc.) are independent of each other.

From the error structure thus computed, we observe that their impulse responses (Figure B.2) are fading away within a span of 5–6 years affirming both the stability and the short–run nature of our system. Also, there is interlinkage between the growth rates of the sectors as 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 response to a shock in agricultural output remains static.

The boost due to growth in sectoral credit disbursement renders instantaneous positive impact on output growth of both agriculture and TTSER sector. For industry, the response is not that instantaneously positive but more prolonged than that in other two. This is quite natural because a boost in credit requires to be utilised in the form of capital goods in next and subsequent periods.

Besides, 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 at shorter horizon of 1–period. Although it reduces at longer horizon, but still remains significant – about 25% for agriculture and 46.4% for TTSER sector growth at a horizon of 4–6 steps ahead. The contribution of banking credit in explaining the growth of industry output, however, remains very low at 0.21% at 1–period and 1.16% at 6–period horizon. It is due to this inadequacy of banking credit for industries that Development Financing Institutions (DFIs) have emerged 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, industrial output contributes (34% at 1–step and 28% at 6–step) in explaining the variation in growth of the TTSER sector output. Further, 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 contribution from all the 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).

In Chapter 4, we investigate whether such impactful and significant financial intermediation also helped in impact the standard of living by reducing the income inequality or not. For this purpose, we studied the liberalisation and post-liberalisation years of 1990–2012 for 13 major states in India in an environment of state level Gini, per-capita state income and developmental expenditure incurred by the respective state governments.

With all non-stationary and cointegrated variables, we observe that financial intermediation and economic growth has an initial negative impact on income inequality but that is not consistent and the impact is positive in next period (Table C.2). However, the overall impact of financial depth is negative while that of economic growth is positive. Therefore, we conclude that financial depth has helped in reducing the income inequality while economic growth of the states has actually aggravated it.

As far as the explanatory power is concerned, we observe unidirectional causality running from economic growth to income-inequality and financial depth (Table C.3). The second observation is an evidence favouring existence of 'Robinsonian view' at the state level. Additionally, we observe that bi-directional causality runs from financial depth to developmental expenditure and income inequality as well as from developmental expenditure to income inequality.

At the closure, we accept that although we have tried to answer some of the unexplored questions in context of 'finance-growth' nexus in India, however, a lot still remains unanswered. In a way, those are the limitations of the present thesis and opens the avenues for further research and exploration to unveil the interrelationship between the financial sector and the real sector given the variety of complex environments in which they operate.

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8. Publication Citation

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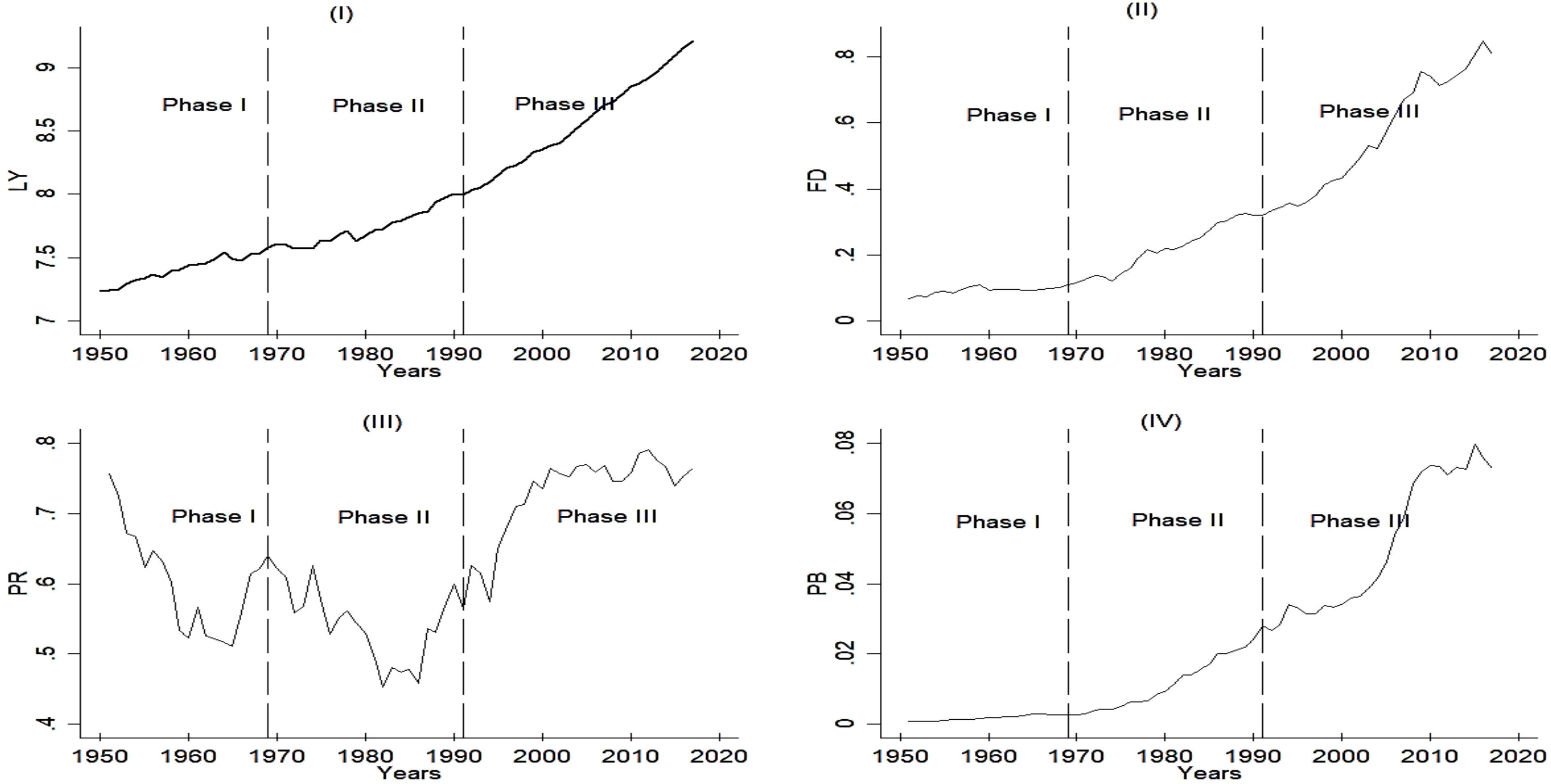
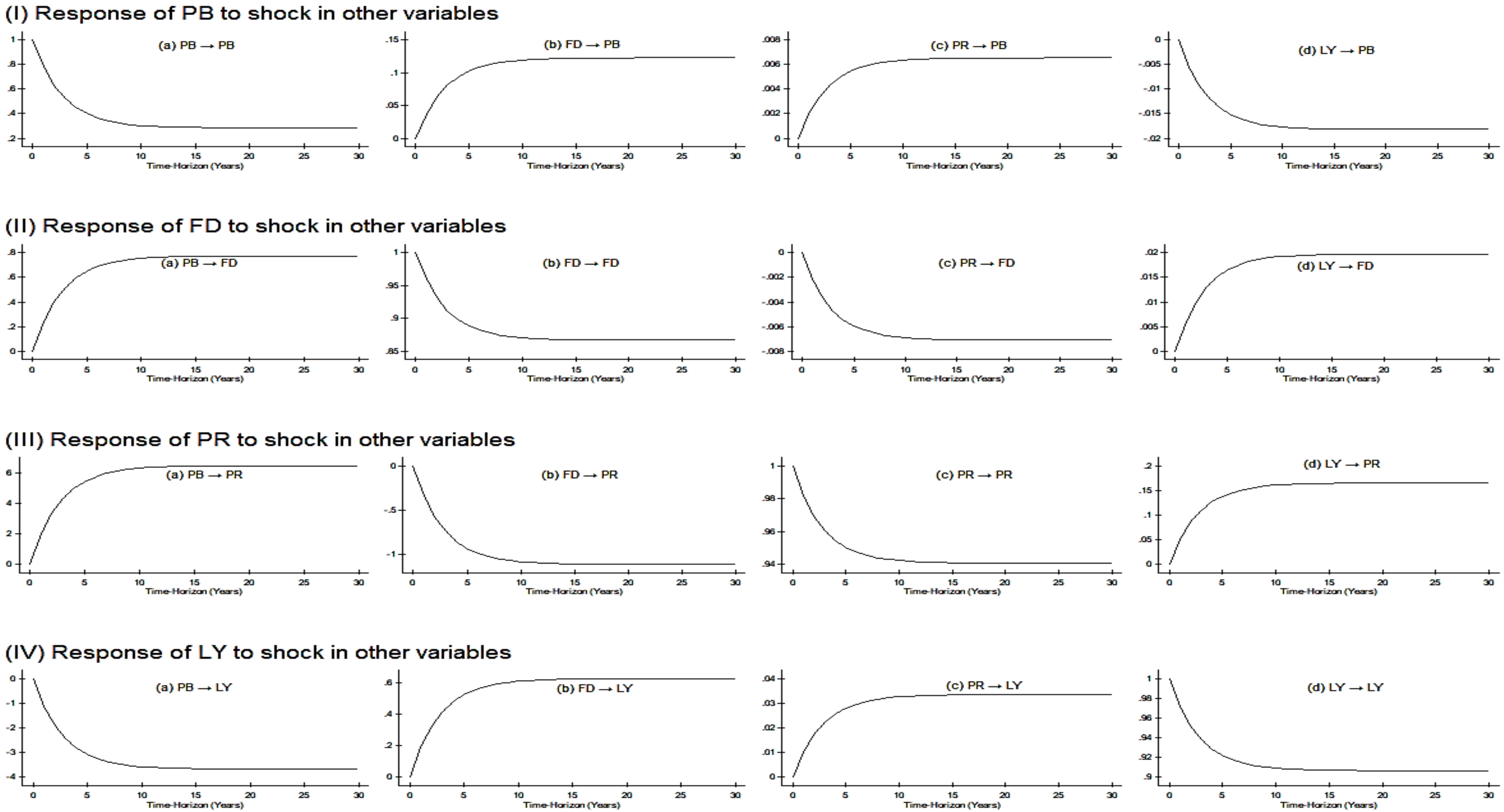
APPENDIX

Figure A.1: Key Variables during the Policy Phase I (1951–1969), II (1970–1991) and III (1992–2017)



Source: Computed from NAS, MOSPI and DBIE, RBI data. 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.

Figure A.2: Impulse response to one–standard–deviation shock



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

Table A.1: 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. Clarity to the extent of Parliamentary power. 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 A.2: Result of error–correction estimates

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

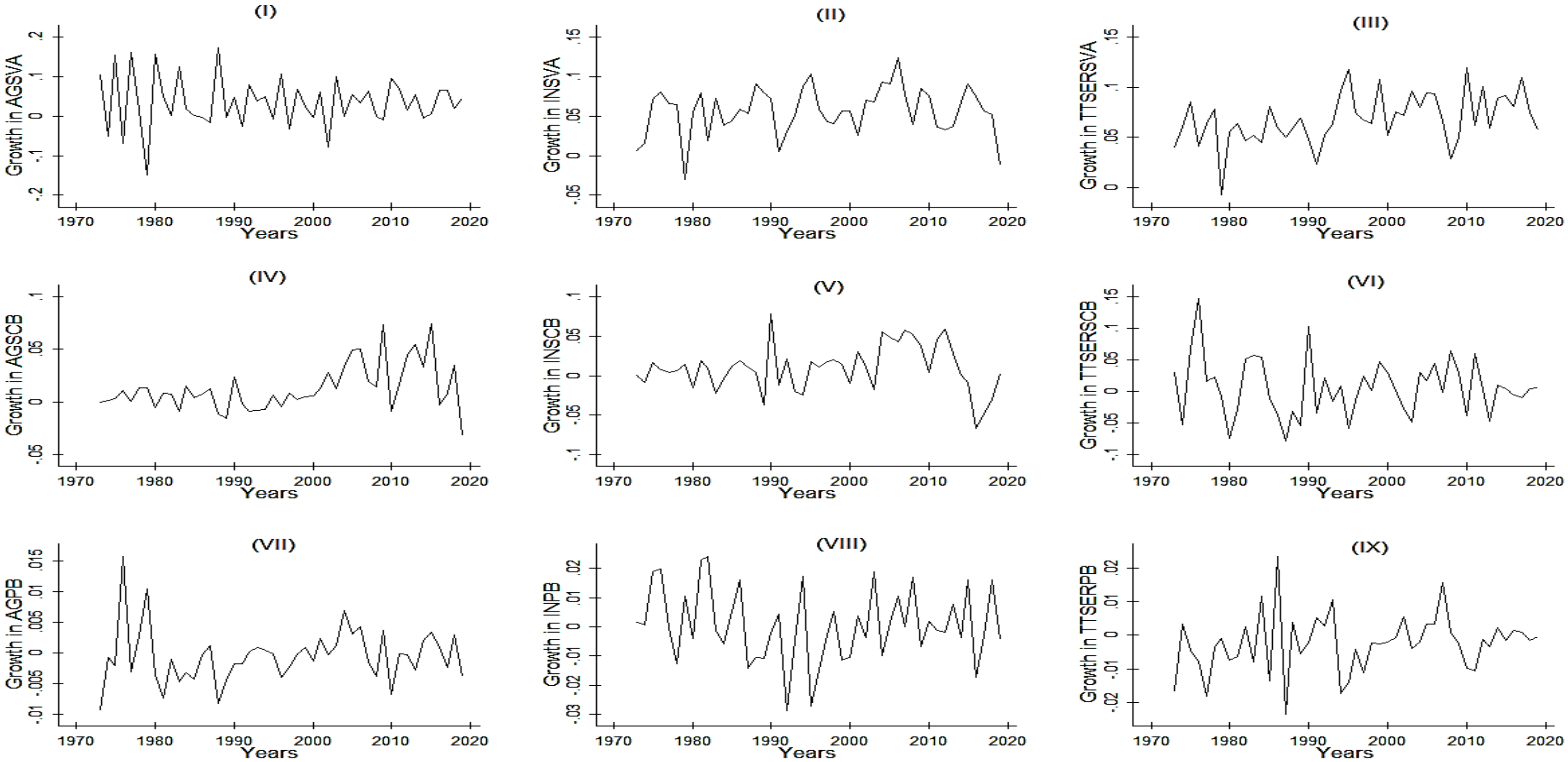
*Source: Author's calculation. Standard Error in parentheses. Here, ***, **, * corresponds to rejection of null hypothesis at significance level of 1%, 5% and 10% respectively.*

Table A.3: Result of FEVD of the system 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

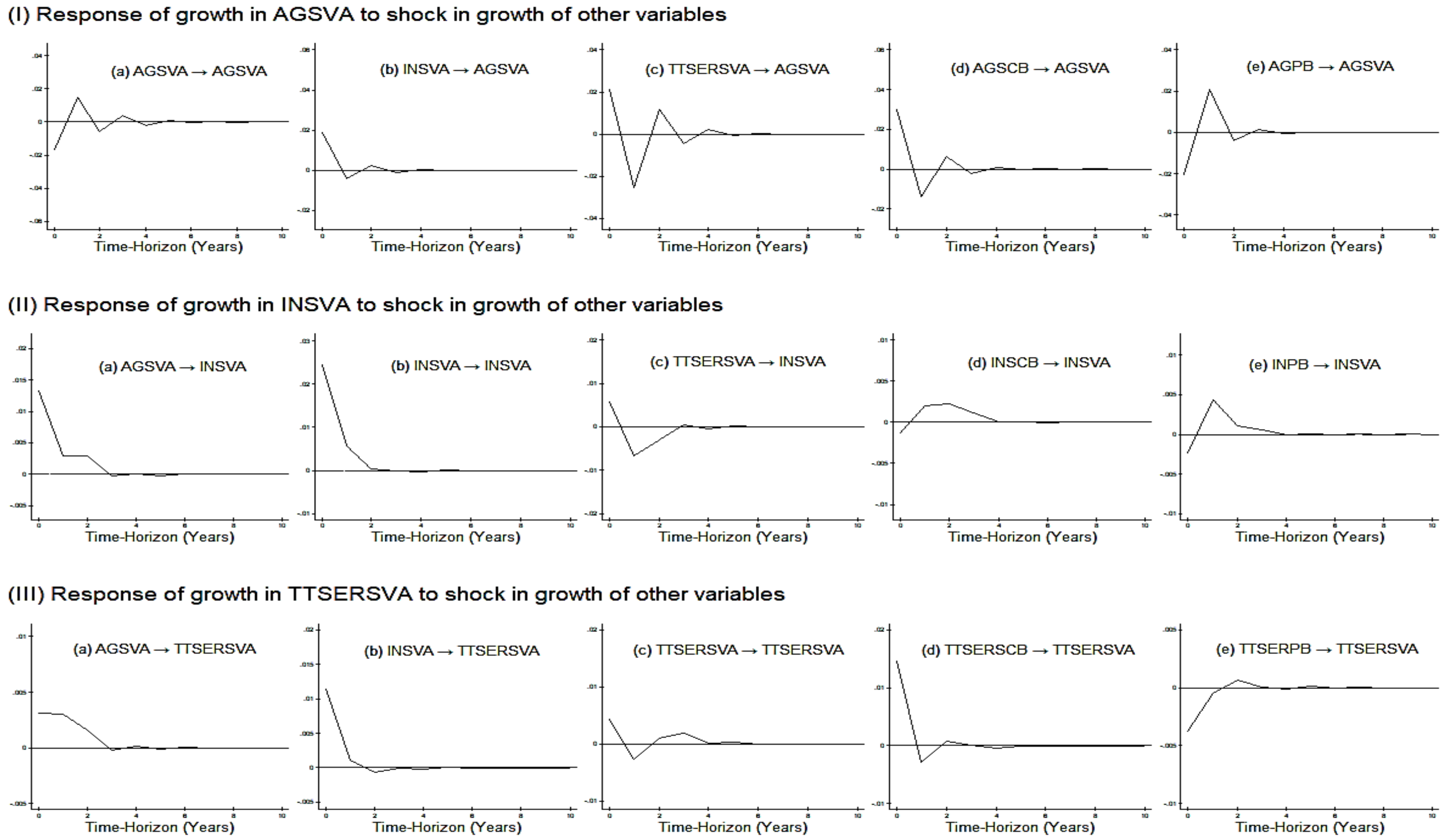
Source: Author's Calculation. FEVD computed on basis of Monte Carlo Simulation using 200 replications for 30 periods.

Figure B.1: Growth rates of the variables under study



Source: Computed from National Accounts Statistics, 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.

Figure B.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 B.1: Relationship between residual error and structural error

$$\begin{bmatrix} e_t^{AGPB} \\ e_t^{INPB} \\ e_t^{TTSERPB} \\ e_t^{AGSCB} \\ e_t^{INSCB} \\ e_t^{TTSERSCB} \\ e_t^{AGSVA} \\ e_t^{INSVA} \\ e_t^{TTSERSVA} \end{bmatrix} = \begin{bmatrix} 0.0034 & 0 & 0 & 0 & 0 & 0 & 0.0013 & 0 & 0 \\ 0 & 0.0117 & 0 & 0 & 0 & 0 & 0 & 0.0019 & 0 \\ 0 & 0 & 0.0074 & 0 & 0 & 0 & 0 & 0 & 0.0009 \\ 0 & 0 & 0 & -0.0036 & 0 & 0 & 0.0191 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0.0239 & 0 & 0 & 0.0066 & 0 \\ 0 & 0 & 0 & 0 & 0 & -0.0169 & 0 & 0 & 0.0371 \\ -0.0211 & 0 & 0 & -0.0303 & 0 & 0 & -0.0150 & -0.0180 & 0.0208 \\ 0 & 0.0008 & 0 & 0 & -0.0031 & 0 & 0.0135 & -0.0244 & 0.0053 \\ 0 & 0 & -0.0048 & 0 & 0 & 0.0168 & 0.0058 & -0.0111 & 0.0052 \end{bmatrix} + \begin{bmatrix} \varepsilon_t^{AGPB} \\ \varepsilon_t^{INPB} \\ \varepsilon_t^{TTSERPB} \\ \varepsilon_t^{AGSCB} \\ \varepsilon_t^{INSCB} \\ \varepsilon_t^{TTSERSCB} \\ \varepsilon_t^{AGSVA} \\ \varepsilon_t^{INSVA} \\ \varepsilon_t^{TTSERSVA} \end{bmatrix}$$

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

$$e_t^{AGPB} = 0.0034\varepsilon_t^{AGPB} + 0.0013\varepsilon_t^{AGSVA}$$

$$e_t^{INPB} = 0.0117\varepsilon_t^{INPB} + 0.0019\varepsilon_t^{INSVA}$$

$$e_t^{TTSERPB} = 0.0074\varepsilon_t^{TTSERPB} + 0.0009\varepsilon_t^{TTSERSVA}$$

$$e_t^{AGSCB} = -0.0036\varepsilon_t^{AGSCB} + 0.0191\varepsilon_t^{AGSVA}$$

$$e_t^{INSCB} = 0.0239\varepsilon_t^{INSCB} + 0.0066\varepsilon_t^{INSVA}$$

$$e_t^{TTSERSCB} = -0.0169\varepsilon_t^{TTSERSCB} + 0.0371\varepsilon_t^{TTSERSVA}$$

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

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

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

Table B.2: Results of FEVD estimation

Structural Shocks		**Impact Horizon (in Years) Ahead**					
Response	**Impulse**	**1**	**2**	**4**	**6**	**8**	**10**
ΔAGSVA	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
	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
ΔINSVA	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
	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
ΔTTSERSVA	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	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.

Table C.1: List of 13 Major States in India established by 1960

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		

Note:

1) All-states (except Uttarakhand) with Special Category Status (SCS) which includes Jammu and Kashmir, Ladakh, Himachal Pradesh and North-Eastern states have been omitted.

2) States of Punjab and Haryana considered together as one state because they remained one until the Punjab Reorganisation Act, 1966.

3) Indian states like Bihar, Madhya Pradesh and Uttar Pradesh experienced a split into three new states – Jharkhand, Chhattisgarh and Uttarakhand (an SCS since 2001) respectively in 2000.

Table C.2: Error correction mechanism estimates

Explanatory Variable	Dependant Variables			
	$\Delta \boldsymbol{LSG_{i,t}}$	$\Delta \boldsymbol{FDEP_{i,t}}$	$\Delta \boldsymbol{LPCSP_{i,t}}$	$\Delta \boldsymbol{DEVR_{i,t}}$
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)
$\Delta FDEP_{i,t-1}$	-0.1772*	0.0002	0.0033*	0.0014*
	(0.0691)	(0.0005)	(0.0014)	(0.0006)
$\Delta LPCSP_{i,t-1}$	-1.5457	0.2647*	-0.0866	0.6950**
	(9.8131)	(0.0674)	(0.1840)	(0.0833)
$\Delta DEVR_{i,t-1}$	-6.3902	-0.1365*	-0.1831	0.2653**
	(8.6239)	(0.0624)	(0.1705)	(0.0772)
$\Delta LSG_{i,t-2}$	-4.6311	-0.2017*	-0.0962	-0.0206
	(3.5612)	(0.0261)	(0.0712)	(0.0322)
$\Delta FDEP_{i,t-2}$	2.2696	0.0695*	-0.0128	0.1604**
	(4.0174)	(0.0286)	(0.0781)	(0.0353)
$\Delta LPCSP_{i,t-2}$	-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)
μ_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 C.3: Result of pair-wise Granger causality

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.