Growth of Finance, Real Estate and Business Services: Explorations in an Inter-Sectoral Framework

No. 162
09-May-16 #
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New Delhi

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Abstract

The Indian growth experience over the past several decades has been service led. More recently, within services, Finance, Insurance, Real Estate and Business Services (FINREBS) has been the fastest growing sector, with its share in GDP rapidly rising to around 22 percent in a relatively short time-frame. What relation does the growth of FINREBS have with the rest of the sectors of the economy?

Empirical exploration using input-output tables and econometric methods shows that FINREBS ranks low in backward and forward linkages compared to most other sectors of the economy. It is difficult to imagine FINREBS as a `leading sector' in the Hirschman sense. Rolling co-integration to study the evolution of long-term relationships shows an increasing co-movement in output of FINREBS and agriculture and allied activities. However, for most other sectors the association with FINREBS is insignificant or weak. Variance decomposition of forecast error corroborates that a large percentage of variation in the growth of FINREBS cannot be explained by other sectors of the economy, which gives FINREBS an autonomous character. The probable reasons for the 'autonomous' nature of growth in FINREBS are explored briefly in the paper.

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An earlier version of the paper was presented at an international conference organised by the Academy of International Studies, Jamia Millia Islamia, New Delhi at India International Center, 9-10 February, 2015. We would like to thank Prof. Sunanda Sen for invitation to the conference and acknowledge the rich feedback received from the participants. Authors alone are responsible for errors in the paper.

#An update has been made on page 18 and 19 to the original version published on 16 February, 2016.

I. Nature of Present Growth Phase in Services

There are two sets of contrary evidence on the question of growth of the service sector vis-à-vis non-service sectors that have co-existed side by side for the Indian economy. A set of studies have argued that the Indian economic growth since 1980s is by and large led by service sector growth, which, not being a commodity producing sector depends on both industry and agriculture for its growth. The stylization of service sector in macroeconomic models show the service sector output as dependent on incomes and output in the commodity (goods) sector.[1] Co-integration analysis by Kaur, Bordoloi and Rajesh (2009) points to the long-term equilibrium relationship of services with agricultural and industrial sectors. Debnath and Roy (2012) examining the growth of the regional economies of North East for the period 1981 to 2007 conclude that the income of economies of North East depends on income generation from the service sector, and income growth of service sector in turn depends on the growth of agriculture and industry. More recently and in the context of the debate on the new GDP series, Goldar (2015) relies on the interdependence between services and manufacturing in that the growth rates do not diverge very much over time to uphold the higher growth in manufacturing in the new GDP series. It would be an aberration, at best short lived, if services were to move independently of the commodity producing sector.

On the contrary, a second set of studies has failed to find a convincing link between service sector and commodity (non-service) sector. Among those who pointed to the autonomous nature of service sector growth, two studies are of particular importance. Back in 1988, Ashok Mitra noted the disproportionate rise of the service sector in India's national income. *"The explosion in service activities cannot be readily attributed to any impulse transmitted by the sectors engaged in material production. It has an autonomous character and is a kind of superimposition on the natural forces of historical evolution." (p.6)* Within the services sector the highest rate of growth at the time was being registered in public administration and defence, that is, in the arena of government activities. Expansion in public administration and defence had little causal relationship with developments in either agriculture or industry.

The issue of Disproportionate growth of tertiary sector in the Indian economy was brought up in another paper by B.B. Bhattacharya and Arup Mitra (1990). They found that except in the case of trade group, commodity output had very little relationship with service income. The growth rate of service income is independent of the growth rate of the commodity sector income was the broad conclusion. Both these studies looked at the components of services to understand the impetus for growth.

The context of this debate provides a useful entry point to examine the present phase of service- led growth, which has seen significant growth in certain categories of services.

Trend Growth in FINREBS

The growing service sector comprises of three types of services corresponding broadly to National Accounts classification:

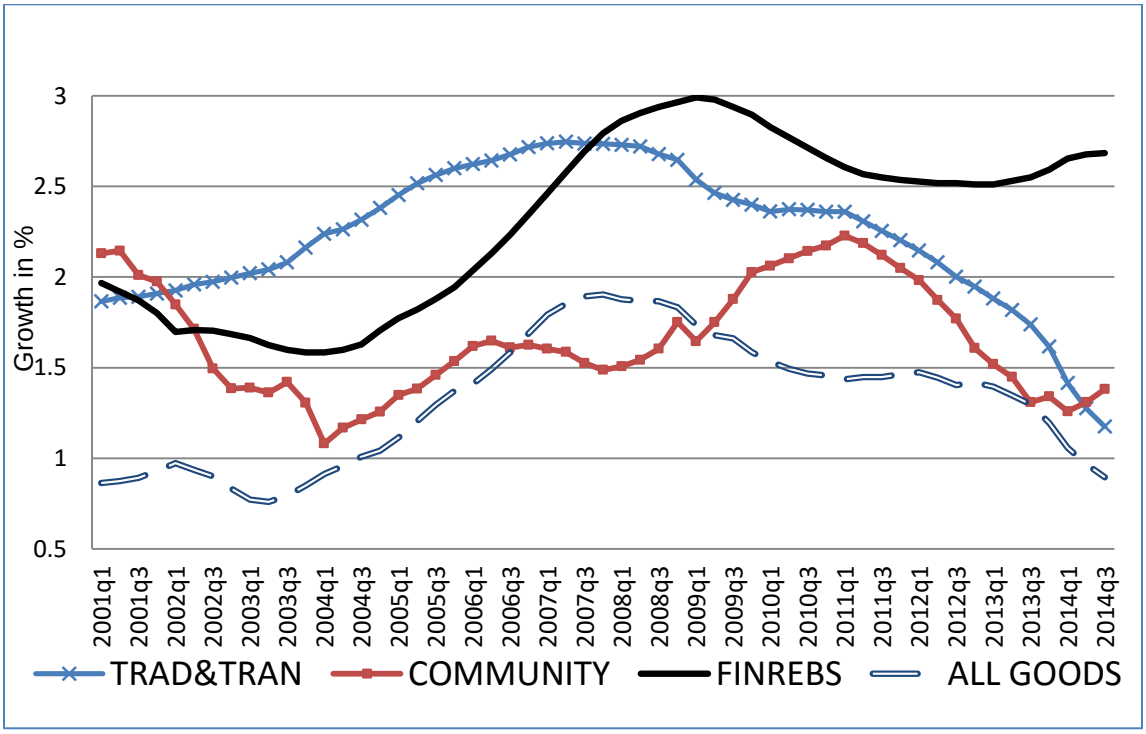
(i) Trade, hotel, transport and communications (TRAD&TRAN);
(ii) Community, Social & Personal Services (COMMUNITY); and
(iii) Finance, Insurance, Real Estate & Business Services (FINREBS).

Trend growth rates of these services in real terms in the last fifteen years are examined below.

[1] See Kar and Pradhan, 2009.

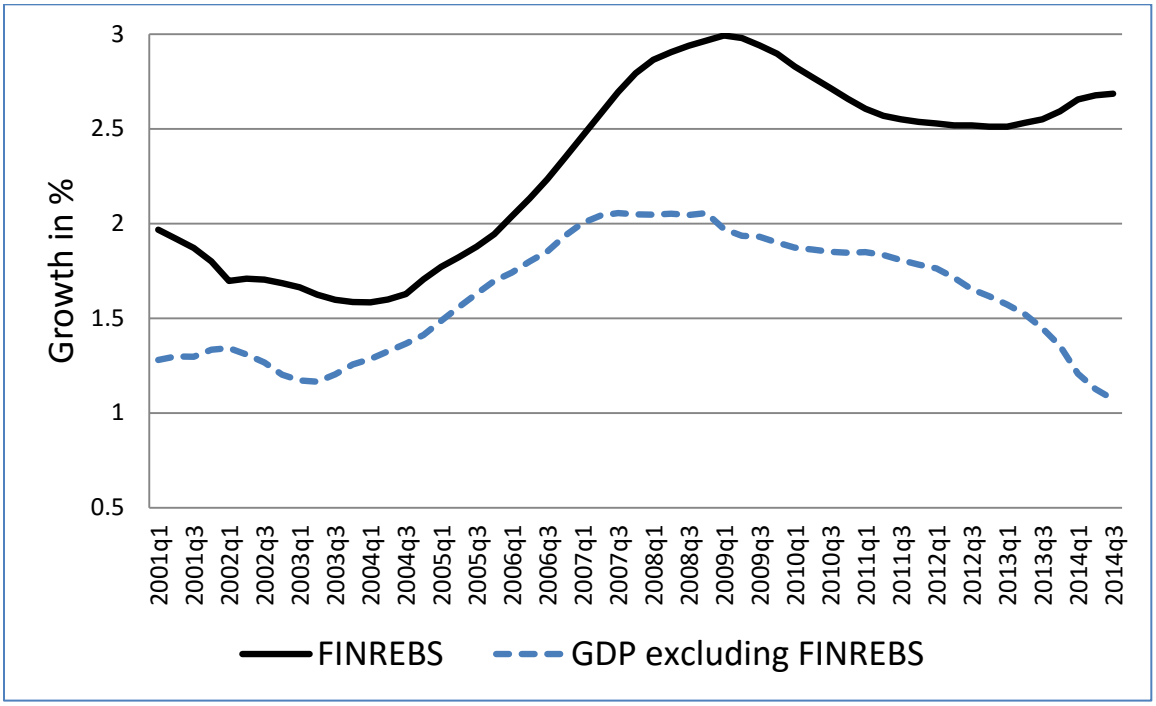
Figure 1(a) shows the quarter on quarter (5 years rolling) growth rate of three components of services (TRAD&TRAN, COMMUNITY and FINREBS) and all goods since the year 2001: Q1. Rolling estimates of growth smoothen out the short run fluctuations. Dataset consists of quarterly data from 1996:Q2 to 2014:Q3 (calendar year) at 2004-5 prices. [2] Since 5-year rolling estimates have been obtained, the rolling growth rates begin from 2001: Q1. Fig 1(b) traces the growth of Finance, Insurance, Real Estate & Business Services (FINREBS) vis-à-vis the rest of the sectors of the economy (GDP excluding FINREBS).

Figure 1(a): Quarterly Growth Rate (Rolling)



[2] Quarterly data on GDP is available on 1999-00 base & 2004-05 base. There is no linking factor available to get a uniform dataset. Data preceding 2004-5 was transformed in two steps. Quarterly data on 1999-00 base was deseasonalized using X-12 ARIMA. Using the growth rate of deseasonalized series, deseasonalized quarterly series on 2004-5 base was extrapolated backwards to create a uniform series.

Figure 1(b): Quarterly Growth Rate (Rolling)



***Source**: RBI, Database on the Indian Economy and authors' calculations*
Note: The rolling estimates were developed using

$$Lny_t = \beta_t + \beta_t t + \mu_t$$

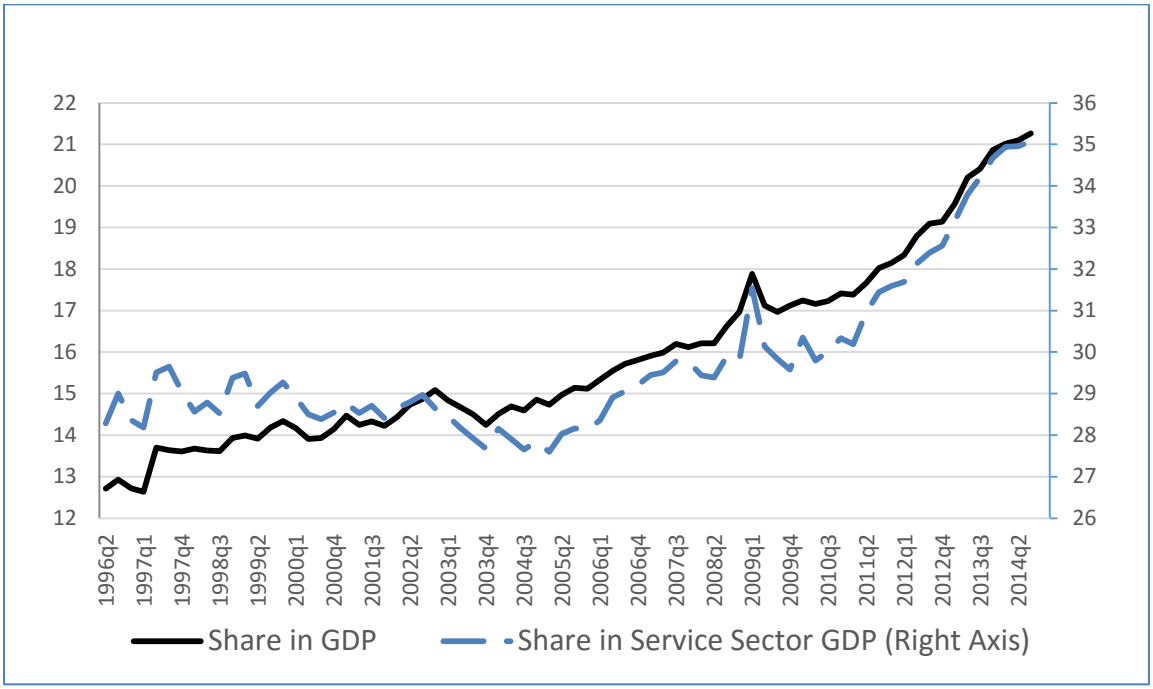
where, y represents the different components of GDP. In rolling estimation the initial period of 20 quarters is taken and each subsequent estimation added one recent quarter and excluded the oldest quarter. Rolling estimates have been used to look at the growth rate as it is less volatile in comparison to the actual growth rate.

- Between 2001:Q1 and 2007-8:Q3, TRAD&TRAN sector was the fastest growing sector amongst services (Fig 1(a)). Thereafter, growth of TRAD&TRAN has continuously declined, whereas Finance, Insurance, Real Estate & Business Services (FINREBS) growth shot up. FINREBS has maintained a high growth rate throughout except for a small decline from 3% to 2.5% quarter on quarter growth between 2009:Q1-2012:Q4. Growth of COMMUNITY sector accelerated from 2009:Q1 to 2011:Q1, probably a reflection of countercyclical policy of the government. The growth of COMMUNITY subsequently fell as the government resumed its policy on fiscal consolidation. Unlike the period Mitra (1988) was referring to, growth of COMMUNITY has been the lowest among the three types of services beyond 2002.

- Across the period FINREBS sector has grown at a rate higher than the rest of the sectors of the economy taken together (Fig 1(b)). The growth differential clearly widened since 2007. Even so, the direction of movement of growth of FINREBS and the rest of the sectors of the economy was similar till 2011. As growth of the economy plummeted further, growth in FINREBS defying the trend showed upward movement (but for the last few quarters of the sample period).

- Higher growth of FINREBS compared to the rest of the sectors of the economy is reflected in its rising share in service GDP and overall GDP (Fig 2). Since 2005, FINREBS has grown phenomenally; not only its share in GDP has risen to around 22% by the 2014 Q3 but also its share in service output has increased to around 35% from 28% in 2005.

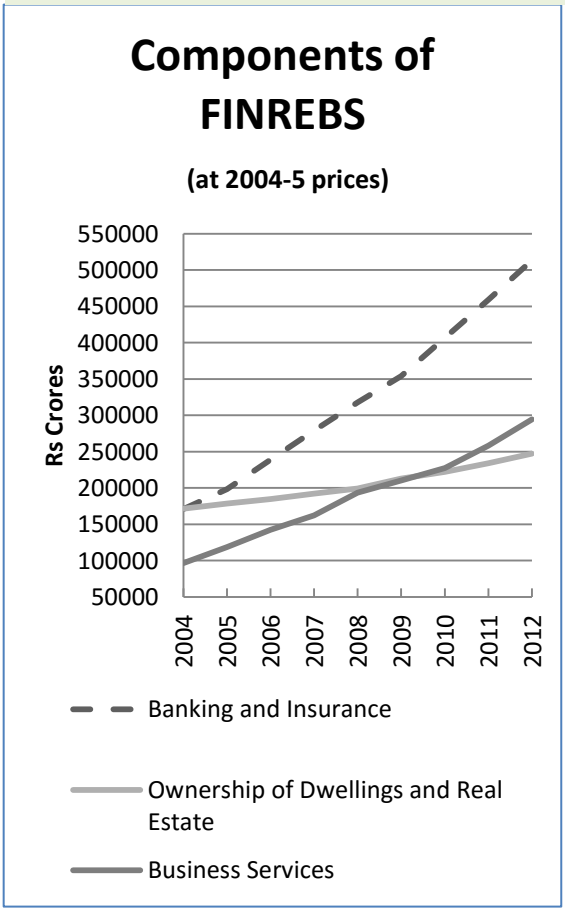
Figure 2: Share of Finance, Insurance, Real Estate & Business Services (FINREBS)

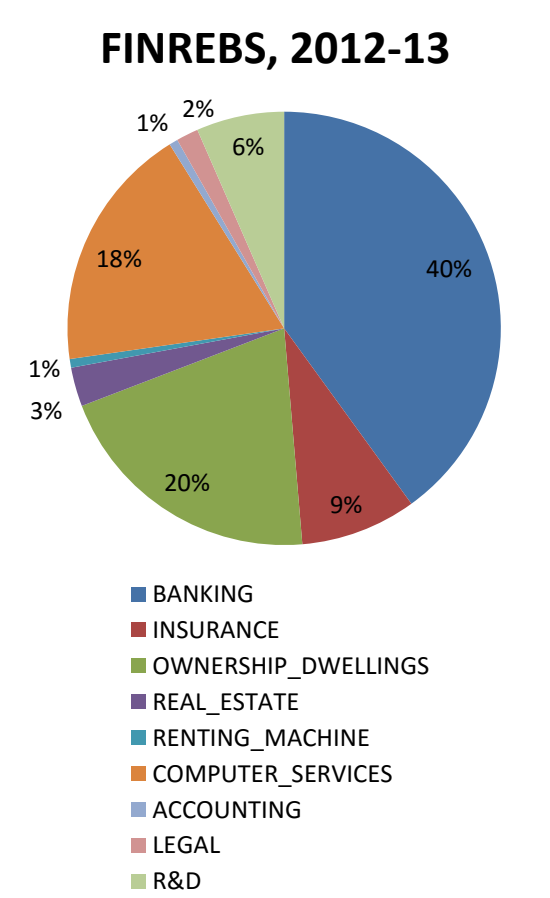


Source: *RBI, Database on the Indian Economy and authors' calculations*

BOX: What constitutes FINREBS?

FINREBS comprises of a large number of services that can broadly be clubbed into three components: (i) Banking and insurance; (ii) Ownership of dwellings and real estate; and (iii) Business services. While the first component relates to finance, the second comprises of property and related services, and the third component consists of business services. Banking and insurance covers commercial banks, non-banking financial corporations (organized and unorganized) post office savings bank, cooperative credit societies, life and non-life insurance activities. The gross output of banks and similar financial institutions are estimated in two components, actual service charges and imputed service charges. Ownership of dwellings refers to services of occupied residential houses and real estate services include activities of all types of dealers such as operators, developers and agents connected with real estate. Business Services include computer and related activities in private sector, legal activities, accounting, book-keeping & auditing activities and tax consultancy services. Besides, renting of machinery & equipment without operator, research and development, market research and public opinion polling, business & management consultancy, architectural, engineering & other technical activities, advertising etc. also fall under business services.





Source: NAS

Since 2004-5, banking and insurance sectors have grown at a rapid rate and consolidated their position within FINREBS. In 2012-13, banking and insurance comprise 49% of total output of FINREBS. Ownership of dwellings and real estate comprise another 23%, such that the combined share of these two segments is 72% of GDP of FINREBS. Business services which include the fast growing computer services segment contributed 28% of FINREBS output.

A priori, one would hold that the growth of FINREBS would have a reasonable interlinkage with the rest of the sectors of the economy. For banking, insurance, real estate and business services could all feed into growth of commodity sectors and vice-versa. However, in the kind of finance-led growth India has witnessed in the recent period, the linkages of Finance, Insurance, Real Estate & Business Services sector with the other sectors of the economy have probably been weak such that the expansionary phase of this sector has not been accompanied by a revival of overall economic growth.

The next three sections of this paper try to empirically explore this hypothesis. Section 2 explores inter-sectoral relations using the input-output matrices for the Indian economy. FINREBS ranks low in backward and forward linkages compared to most sectors of the economy. Section 3 applies rolling recursive cointegration to quarterly data specifically to study the relationship of FINREBS vis-à-vis other sectors. We find that the associations between FINREBS and other sectors of the economy have been variable across time and are sector-specific. An interesting result is the increasing co-movement in output of FINREBS and agriculture and allied activities; however, for most other sectors the association with FINREBS has been insignificant or weak. Section 4 approaches the connectedness question using forecast error variance decomposition. A large percentage of variation in the growth of FINREBS cannot be explained by other sectors of the economy, which gives FINREBS (and thereby services) an autonomous character. Section 5 posits possible explanation on how this might be possible and connects the weak linkages to the present impasse in the banking system. Section 6 concludes.

II. Inter-linkages Across Sectors: Analysis of input-output Matrices

In order to understand the nature of relationship between FINREBS and other sectors of the economy linkage effects provide a useful framework. The structural relationship between sectors can be measured in terms of two types of linkage effects first described by Albert Hirschman (1958). Backward linkage effects are related to derived demand, i.e. the provision of input for a given activity. Forward linkage effects are related to output utilization, i.e. the outputs from a given activity will induce attempts to use this output as inputs in some new activities.

The idea underlying the measures of linkages is that industries provide the driving forces for the expansion of the system through their activities, or rather through the input demands as well as output production stemming from these activities. Economic systems with a high degree of interrelatedness and strong causal linkage effects are more dynamic than systems with few causal linkages due to few incentive-driving activities in the existing industries. As Drejer (2002) notes that what is studied is the systemic character of an economy: no unit - firm or industry – exists in isolation from the other units in the system. Linkage effects have been used extensively to identify the key or the leading sectors of the economy.

Linkage measures are computed using input-output tables for the Indian economy for the three latest years 1998-9, 2003-4 and 2007-8. Industries in the input-output table are aggregated into eight categories corresponding to the NAS classification:

- agriculture and allied activities (AGRI),
- mining (MIN),

- manufacturing (MFG),
- construction (CONSTR),
- electricity, gas and water supply (EG&WS),
- transport, storage & communication and trade, hotels and restaurants (TRAD&TRAN),
- community, social and personal services (including public administration and defence) (COMMUNITY)
- Financing, Insurance, Real Estate and Business Services (FINREBS)

Backward linkage

Backward linkages exist when the growth of an industry leads to the growth of the industries that supply it. Table 1 presents the matrix A of technical coefficients (a_{ij}) for the Indian economy in 1998-9. It is an 8 x 8 matrix with j^{th} column giving the inputs of all the sectors in the economy required in the production of one unit of the j^{th} sector output. The i^{th} row on the other hand provides a sense of how one unit of output of the i^{th} sector would be used by all other sectors of the economy as intermediate good in production, while some may be used for final consumption (not shown in Table 1). Direct backward linkage for j^{th} sector is the sum of the elements of the j^{th} column, which provides a measure of how much input would be required to increase production of the j^{th} sector output by one unit.

Table 1: Matrix A of input coefficients for 2007-8

	AGRI	MIN	MFG	CONSTR	EG&WS	TRAD&TRAN	FINREBS	COMMUNITY
AGRI	0.191	0.000	0.069	0.025	0.001	0.038	0.000	0.002
MIN	0.000	0.007	0.121	0.014	0.098	0.001	0.000	0.000
MFG	0.058	0.102	0.367	0.291	0.146	0.167	0.026	0.057
CONSTR	0.007	0.018	0.008	0.118	0.021	0.010	0.023	0.006
EG&WS	0.010	0.019	0.018	0.011	0.154	0.010	0.012	0.002
TRADE&TRANS	0.072	0.046	0.132	0.122	0.104	0.118	0.046	0.042
FINREBS	0.009	0.021	0.036	0.037	0.048	0.038	0.062	0.021
COMMUNITY	0.001	0.015	0.009	0.000	0.002	0.003	0.015	0.013
Direct Backward Linkage of Sector j	0.347	0.229	0.761	0.618	0.575	0.385	0.183	0.142
RANK	5	6	1	2	3	4	7	8

Analysis of input coefficients in table 1 reveals manufacturing, construction and electricity, gas and water supply (the secondary sector) have the strongest backward linkage, followed by trade and transport among service sector activities. AGRI comes next in terms of demand for inputs from other sectors as a proportion of total output of the AGRI sector. The last two sectors in regard to backward linkage are FINREBS and COMMUNITY. FINREBS one of the fastest growing sector of the Indian economy has one of the lowest backward linkage and ranks seventh amongst the eight sectors of the economy. Backward linkage from FINREBS to each individual sector can be read along the column FINREBS in matrix A. It is maximum to FINREBS itself though even this coefficient is low. Next three sectors in decreasing order to which FINREBS has a backward linkage are TRADE&TRANS, MFG and CONSTR.'

To see the evolution across time, input-output matrices for the three years, 1998-9, 2003-4 and 2007-8 are compared. Backward linkage effects computed using the $(I-A)^{-1}$ matrix gives both direct and indirect backward linkages for the respective years. The inverse matrix coefficients indicate the magnitude of the ultimate direct and indirect production repercussions on

the `n' industrial sectors when there is one unit of final demand for j^{th} sector. The results are summarized in Table 2.

Table 2: Summary of Backward Linkage (direct and indirect): Inter-sectoral and Inter-temporal Comparison

YEAR		AGRI	MIN	MFG	CONSTR	EG&WS	TRAD &TRAN	FINREBS	COMMUNITY
1998-9	Backward Linkage (Direct and Indirect)	1.42	1.41	2.36	2.048	2.177	1.675	1.279	1.606
	Backward linkage index	0.81	0.81	1.35	1.172	1.246	0.959	0.732	0.919
	RANK	6	7	1	3	2	4	8	5
2003-4	Backward Linkage (Direct and Indirect)	1.67	1.55	2.52	2.289	2.561	1.813	1.366	1.283
	Backward linkage index	0.89	0.82	1.34	1.217	1.362	0.964	0.726	0.682
	RANK	5	6	2	3	1	4	7	8
2007-8	Backward Linkage (Direct & Indirect)	1.65	1.49	2.61	2.399	2.172	1.814	1.334	1.290
	Backward linkage index	0.89	0.81	1.42	1.3	1.177	0.983	0.723	0.699
	RANK	5	6	1	2	3	4	7	8

Across the three time points, manufacturing, electricity, gas and water supply and construction have consistently had the strongest backward linkage. This is seen in the Backward Linkage Index (BLI), which gives the backward linkage of the particular sector relative to the average backward linkage of the system as a whole.[3] BLI has a value greater than 1 for the three sectors. After the secondary sector, trade and transport (TRAD&TRANS) has the next highest backward linkage with BLI close to 1. The rest of the sectors of the economy have BLI less than 1.

[3] Backward Linkage index, originally proposed by Rasmussen 1957 (who called it the power of dispersion index) may be defined as

$$BLI_j = \frac{\frac{1}{n}\sum_i b_{ij}}{\frac{1}{n^2}\sum_{ij} b_{ij}}$$

where b_{ij} are the coefficients of $(I-A)^{-1}$ matrix and n is the number of industries. The numerator denotes the average stimulus imparted to other sectors by a unit's worth of demand for sector j. The denominator denotes the average stimulus for the whole economy when all final demands increase by unity. $BLI_j>1$ implies that industry j has higher than average backward linkage.

Significantly, COMMUNITY has moved down from 5th to 8th rank across the years and pushed FINREBS to the 7th rank. The change in relative ranking between COMMUNITY and FINREBS could partly be because of definitional changes. With reclassification of sectors between COMMUNITY and FINREBS, services that were earlier counted as part of community moved into FINREBS.[4]

Backward linkages from all the sectors of the economy, except community, increased between 1998-9 and 2003-4. One may infer that there were growing interlinkages across the sectors, with most sectors moving together between these two time-points. The movements across 2003-4 and 2007-8 show different tendencies across sectors. Rising backward linkage is observed for manufacturing, construction, trade and transport, and community. Backward linkages from the rest of the sectors declined between 2003-4 and 2007-8. FINREBS exhibited a rising trend in backward linkages between 1998-9 and 2003-4 and a declining trend in backward linkages between 2003-4 and 2007-8.

Forward Linkages

It has been argued that service sector may not have enough backward linkages but the forward linkages from this sector could be strong.[5] Higher output of the service sector may induce other sectors of the economy to expand production and utilize more of their inputs. Growth in banking activities will induce industrial and other production dependent on banking services to increase. One expects a fairly high forward linkage in that case.

Table 3 provides the output coefficient matrix for the Indian economy for 2007-8. The output coefficient matrix, O, can be used to analyse the forward linkages (Jones, 1976). Output coefficient is simply x_{ij}/X_i. The row sums provide a measure of the direct forward linkage of each sector.

Table 3: Output Coefficient Matrix, O for 2007-8

	AGRI	MIN	MFG	CONS	EG&WS	TRAD & TRAN	FINREBS	COMMUN	Direct Forward Linkages	RANK
AGRI	0.191	0	0.192	0.023	0	0.06	0	0.001	**0.468**	5
MIN	0	0.007	2.534	0.094	0.111	0.006	0	0	**2.753**	1
MFG	0.021	0.005	0.367	0.093	0.008	0.095	0.006	0.011	**0.606**	3
CONSTR	0.007	0.003	0.025	0.118	0.004	0.018	0.017	0.004	**0.196**	7
EG&WS	0.063	0.017	0.338	0.065	0.154	0.11	0.056	0.006	**0.809**	2
TRAD&TRAN	0.045	0.004	0.233	0.069	0.01	0.118	0.02	0.014	**0.513**	4
FINREBS	0.014	0.004	0.149	0.048	0.011	0.088	0.062	0.016	**0.391**	6
COMMUNITY	0.001	0.004	0.046	0.001	0.001	0.008	0.018	0.013	**0.091**	8

Mining (MIN), electricity, gas & water supply (EG&WS) and manufacturing (MFG) are the top three sectors with the highest forward linkages with the rest of the economy. The high value of forward linkage for the mining sector is due to the high input use of mining industry by the

[4] In the 2004-5 series of NAS, research & scientific services are placed along with the activities 'real estate, ownership of dwelling and business services sector'. In the earlier series these services were included under 'other services' sector. (p. 168, NAS, Sources and Methods, 2007)
[5] See Hansda (2001)

manufacturing sector, which is essentially met through imports and drawdown of stocks. Construction is the only secondary sector with low forward linkage. Among the service sectors, trade and transport has the highest forward linkage. FINREBS has sixth position among sectors, behind agriculture but ahead of construction and community.

Forward linkage from FINREBS to each individual sector can be read along the row FINREBS in matrix O. Forward linkage from FINREBS is highest to manufacturing, followed by TRADE&TRANS and FINREBS. Manufacturing uses the maximum share of FINREBS output amongst all the sectors.

For comparison across time, forward linkages (direct and indirect) for the years, 1998-9, 2003-4, 2007-8 are computed using the (I-O) inverse matrix (Table 4). Compared to direct linkages, FINREBS moved ahead of AGRI to improve its position from 6th to 5th when ranked in terms of direct plus indirect forward linkages. Forward linkage index (FLI), gives the forward linkage of the particular sector relative to the average forward linkage of the system as a whole.[6] A lower than one figure for FINREBS implies that the forward linkage from FINREBS is lower than the average forward linkage of the system.

Table 4: Summary of Forward Linkage (direct and indirect): Inter-sectoral and Inter-temporal Comparison

	Forward Linkage (Direct and Indirect)	Rasmussen Forward Linkage Index	RANK	Forward Linkage (Direct and Indirect)	Rasmussen Forward Linkage Index	RANK	Forward Linkage (Direct and Indirect)	Rasmussen Forward Linkage Index	RANK
	1998-9			2003-4			2007-8		
AGRI	1.375	0.919	6	1.845	0.758	6	1.972	0.757	6
MIN	1.989	1.33	1	6.061	2.489	1	7.296	2.801	1
MFG	1.542	1.031	3	2.231	0.916	3	2.282	0.876	3
CONSTR	1.134	0.758	8	1.276	0.524	7	1.333	0.512	7
EGW&S	1.73	1.156	2	3.091	1.269	2	2.887	1.108	2
TRAD&TRAN	1.454	0.972	4	1.957	0.804	4	2.066	0.793	4
FINREBS	1.453	0.972	5	1.872	0.769	5	1.803	0.692	5
COMMUNITY	1.289	0.862	7	1.148	0.471	8	1.202	0.461	8

Looking at the trends across time, between 1998-9 and 2003-4, the forward linkage increased for all sectors, except COMMUNITY. Between 2003-4 and 2007-8, the forward linkage increased for all but two sectors electricity, gas and water supply and FINREBS, where it declined.

To sum up, backward and forward linkages from FINREBS have weakened between 2003-4 and 2007-8, the period corresponding to the initial boom in this sector. Forward linkage from FINREBS to the rest of the economy, is below average compared to the rest of the sectors

[6] It is measured in a manner similar to the BLI with the coefficients of $(I-O)^{-1}$ matrix replacing the coefficients of $(I-A)^{-1}$ matrix.

of the economy, and backward linkage from FINREBS is amongst the lowest. Based on the above one can infer that FINREBS cannot be a `leading sector' in the Hirschman sense. Rather finance, real estate and business service seems to have developed as an autonomous sector with limited linkages with other sectors of the economy.

The next section carries forward the enquiry into the relationship between FINREBS and the other sectors of the economy using econometric techniques.

III. Inter-relationship with FINREBS: Cointegration and Causality

Input-output tables are available only at discrete time points. The latest available table for India being only 2007-8, the period since worldwide financial crisis is not captured. Another problem with the use of input-output tables to compute backward and forward linkages is that *input-output analysis is by nature synchronic, whereas linkage effects need time to unfold*.[7] The responses to increase in demand or higher availability of inputs may be lagged. Time series econometric techniques can take care of some of these issues and throw additional light on the inter-sectoral relations.

Cointegration methods have been used by researchers to explore the inter-sectoral relationship as noted in section 1. Interdependence across sectors, either from demand or supply side or both is expected to be manifest in cointegrating equations. Given the interdependence between sectors, the different components of the economy are expected to move together. However, it is also true that different components may receive different shocks and thus, the inter-sectoral relations may change over time. For example, a global slump may affect tradable goods sector (say, manufacturing) the most and because of that the long-run relation between manufacturing and other GDP components may suddenly breakdown. Statistically, the identification of long-run relationship through cointegration is therefore sensitive to choice of sample. More recently, researchers have used cointegration in rolling recursive framework. Johansen cointegration in a rolling recursive framework has been applied by Fiess and Verner (2001) in the context of Ecquador. In Johansen cointegration in a rolling recursive framework, the trace statistics is observed for the time range which gives the measure of long-run cointegrating relationship. If the trace statistics is increasing with time it implies the increasing association of components and *vice-versa*.

In what follows, Johansen cointegration in a rolling recursive framework has been applied to the quarterly GDP series of India after testing for stationarity. The purpose is to test the cointegration of FINREBS output with other sectoral outputs. We have noted that FINREBS has low overall linkages. Specifically, what is the nature of relationship between FINREBS and other sectors of the economy and how has it evolved over time? Cointegration along with causality enables us to understand the evolving nature of relationship between FINREBS and rest of the sectors. COMMUNITY has been excluded as the latter is largely policy determined and there is no a priori reason to expect co-movement of FINREBS and COMMUNITY output.

Stationarity Test: Before moving to formal cointegration testing the stationarity of the variables have been tested as cointegration is applicable in the case of series integrated of order one I(1). Stationarity testing of the variables are done using augmented Dickey Fuller test in generalized

[7] Hirschman, 1977 cited in Drejer, 2002

least square framework (DF-GLS) proposed by Elliott, Rothenberg, and Stock (1996). This test has significantly greater power than the previous versions of the augmented Dickey–Fuller test. The optimum lag is chosen using Schwarz Criterion. Natural logarithm of each component of GDP and first difference of natural logarithm was tested for stationarity. The test statistics are reported in Table 5. All the variables are found to be integrated of order one, $I(1)$.

Table 5: Stationarity Test in the DF-GLS framework

Sample: 1996:Q2-2014:Q3

		DF-GLS Tau Statistics
Variable	Level	First Difference
AGRI	-2.730	-6.936 *
MIN	-1.026	-6.308
MFG	-1.210	-5.049
EG&WS	-1.702	-3.405*
CONSTR	-0.919	-6.293
TRAD&TRAN	-0.785	-5.200
FINREBS	-0.609	-4.455

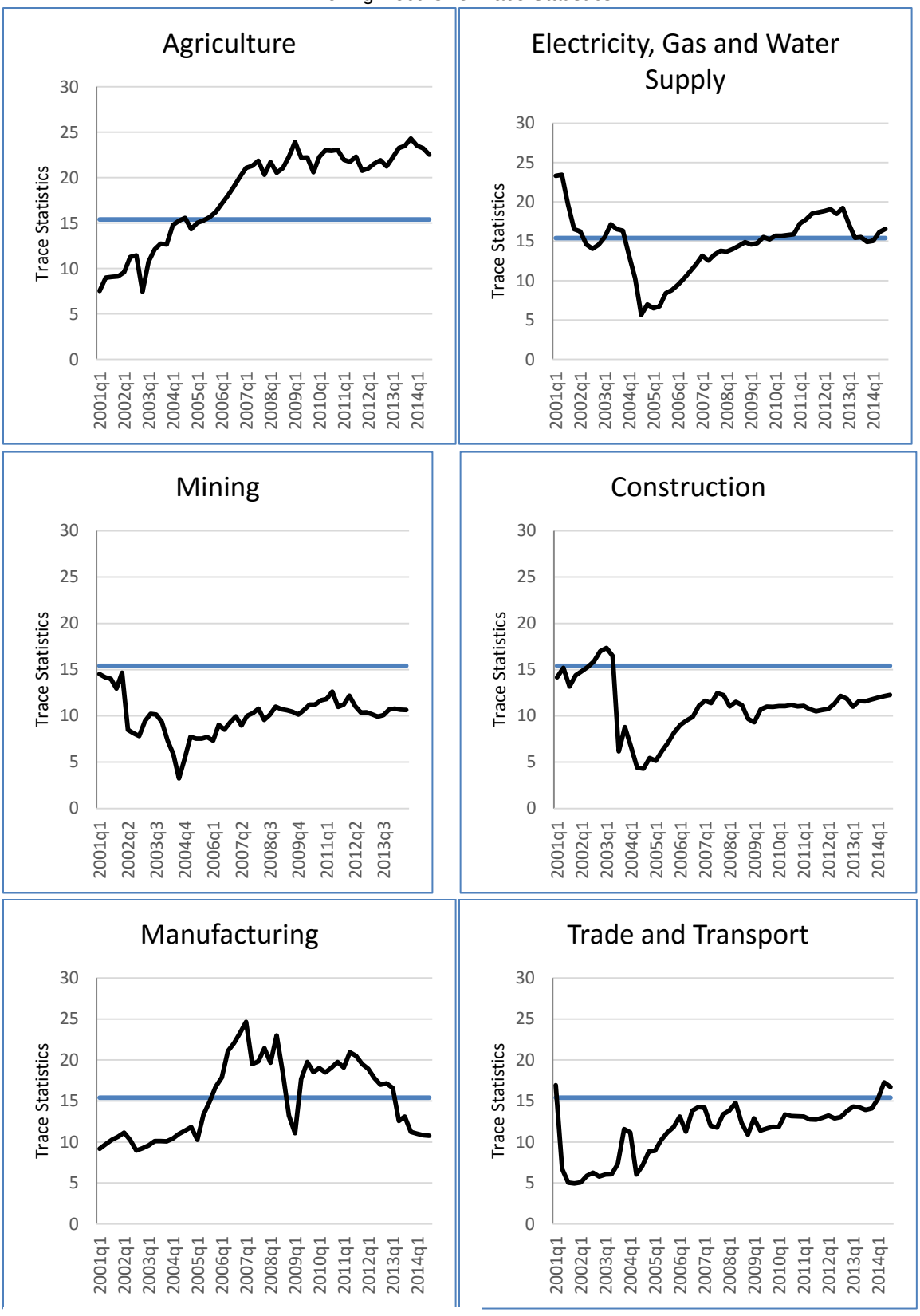
-3.686, -3.118, -2.821 being the critical values at 1%, 5% and 10% respectively for level and -3.690, -2.704, -2.427 for first difference

* Except first difference of Agriculture which was tested at 3 lags and EG&WS which was tested at 2 lags all the tests were done using one lag selected by Schwarz Criteria

Johansen cointegration test: Since log of all the variables are $I(1)$ the Johansen cointegration test in rolling recursive framework is estimated. It is done using trace statistics and maximum eigenvalues. Trace statistics tests for the number of linear combinations (i.e. K) to be equal to a given value (K_0) against the alternative hypothesis for K to be greater than K_0. Fig 3 presents the results of Johansen cointegration of FINREBS with the other components of GDP in a rolling recursive framework. When the trace statistics is higher than the horizontal red line (Critical Value for Null hypothesis of $K_0 = 0$), it denotes the presence of a long run relationship. The first estimation was done with 20 data points and in subsequent estimation one additional data point was added at each step. Results become more robust as sample size increases.

Causality: Sectoral GDP components in levels being non-stationary, the typical Granger causality test can be problematic (Toda-Yamamoto, 1995). Causality is thus tested using using the Toda-Yamamoto method. The results are given in Table 6.

Figure 3: Cointegration Test with FINREBS
Rolling Recursive Trace Statistics



Horizontal Line denotes Critical Values at 5%

Table 6: Causality between FINREBS and Other Sectors
Sample: 1996:Q2-2014:Q3

	Chi Square	Prob> Chi Square
Agriculture Doesn't Cause FINREBS	0.99	0.3195
FINREBS Doesn't Cause Agriculture	16.67	0
Mining Doesn't Cause FINREBS	2.8	0.0943
FINREBS Doesn't Cause Mining	0.26	0.6099
Manufacturing Doesn't Cause FINREBS	8.59	0.0034
FINREBS Doesn't Cause manufacturing	0.42	0.5146
Electricity Doesn't Cause FINREBS	6.55	0.0105
FINREBS Doesn't Cause Electricity	5.96	0.0147
Construction Doesn't Cause FINREBS	5.02	0.025
FINREBS Doesn't Cause Construction	0.4	0.5252
Trade & Trans Doesn't Cause FINREBS	5.59	0.0181
FINREBS Doesn't Cause Trade & Transport	3.22	0.0728

Overall the association between FINREBS and other sectors seem weak, with trace statistics being statistically insignificant for mining, for construction, and lately for manufacturing sector also. With respect to two sectors – Electricity, gas & water supply and Trade & transport though the trace statistics in the latest period has crossed the critical value, it has not been significant in the past/for very long. However, agriculture and FINREBS seem to have a steady and rising association.

Results in Figure 3 and Table 6 are interpreted below:

(a) The trace statistic between agriculture and FINREBS has risen over time and is statistically significant beyond 2005. Beyond 2009/2010, the association although still significant has flattened. Further, causality in Table 6 shows FINREBS cause agriculture and not the other way round.

The link between AGRI and FINREBS is essentially through credit finance (direct and indirect) of agriculture activities. Agricultural credit growth after severe stagnation and neglect in the 1990s, began to revive. Narayanan (2015) studying the ground level credit flows finds that institutional credit as a percentage of value of inputs plus compensation to employees in agriculture in India surged from 42% in 2004-5 to 85% in 2011-12. A range of supply-side policy measures, including debt waiver and interest subvention contributed to flow of credit to agriculture and allied activities by scheduled commercial banks in the recent years. Short-term credit to agriculture to finance working capital needs increased notably. It appears that agriculture being a supply-constrained sector has benefitted from growing FINREBS although after 2010 the relationship has flattened.[8] An in-depth analysis of the sectors would be required to understand the phenomenon fully.

[8] Among others, Balakrishnan (2014) observed that agricultural growth flattened in UPA-2 regime compared to UPA-1 years.

(b) The relationship of FINREBS with manufacturing shows a double dip phenomenon very similar to the movement of growth in manufacturing sector. Before the onset of financial crisis the trace statistics between manufacturing and FINREBS increased and was statistically significant. It dipped sharply with the crisis and recovered and then again dipped such that the relationship is statistically insignificant in the latest periods. Essentially, the relationship between manufacturing and FINREBS is dictated by the former as the causality tests ascertain. Causality is unidirectional running from MFG to FINREBS. Unlike agriculture, where the relationship with FINREBS appeared to be supply driven, movement of FINREBS vis-à-vis manufacturing in particular appears to be demand determined. This is true of mining and construction too (Table 6).

(c) A somewhat surprising result is the comparatively low trace statistics between construction and FINREBS. A priori, one would expect construction and FINREBS to move together given the proximity of finance and real estate (further discussed in Section V). One possible reason why that may not be happening is that finance need not automatically translate to construction activities. For instance, finance may be involved in repurchase of property, acquisition and development of land and other real estate activities and need not give rise to new construction activities. FINREBS may grow by acquisition of assets rather than by creating new assets**.**

(d) The relationship between FINREBS and electricity, gas and water supply has been significant over last few quarter of 2014. Also, vis-à-vis trade and transport, the trace statistics lately shows a significant relationship with FINREBS. In both the cases, causality is bi-directional. The indication of these sectors (electricity, gas, water supply and trade & transport) moving together in the last quarters of the sample period as FINREBS may be due to the growth of FINREBS finally tapering off. Section V discusses why the tapering of FINREBS growth is ultimately inevitable.

IV. Growth Connectedness: Further Econometric Evidence

Cointegration looks at the co-movement of the GDP components and causality provides a sense of the direction of the relationship. Forecast error variance decomposition (FEVD) determines how much of the forecast error variance of each of the variables can be explained due to shocks to the other variables. This is another way to look at the growth connectedness. Similar in format as the input-output table, FEVD combines two advantages: (i) Time series data till the most recent period can be used; (ii) Optimum lag structure takes care of lagged effect on variables and allows us to explore the inter-linkages with lagged effects.

FEVD in the VAR framework is sensitive to the ordering of the variable in the Cholesky framework of recursive VAR or identification scheme in the case of structural VAR. In case of macro modeling the theoretical construct of cause and effect helps us in identification, but with components growth of GDP one is left with no such theoretical construct for identification scheme. Thus we have used generalized VAR framework of Koop, Pesaran and Potter (1996) and Pesaran and Shin (1998) and forecast-error variance decompositions are made invariant to variable ordering in VAR Framework (Diebold and Yilmaz, 2012).

A generalized VAR is estimated between GDP components at lag 1 and lag 4, the latter being based on SIC and AIC criterion. After estimation the forecast error variance is obtained at 10 period (i.e. after 10 quarters) and reported in Table 7 and Table 8.

Table 7: Forecast error variance decomposition at 10 periods with 1 lag
Sample: 1996:Q2-2014:Q3

	AGR	MIN	MFG	EG&W	CONS	TRAD &TRANS	FINREBS	COMMUN	From others
AGR	67.0	14.2	1.9	3.3	0.8	8.0	1.9	2.9	33
MIN	10.7	53.3	3.4	3.2	9.8	17.0	1.5	1.0	47
MFG	2.7	4.7	41.8	1.5	11.4	32.8	4.1	1.0	58
EG&WS	9.5	4.0	2.9	52.5	12.5	4.9	12.9	0.7	47
CONSTR	6.6	0.2	4.7	7.6	62.9	17.0	0.3	0.7	37
TRAD&TRAN	6.6	3.7	17.7	0.6	11.0	56.3	4.1	0.1	44
FINREBS	2.2	0.1	9.0	0.5	1.3	4.3	82.2	0.4	18
COMMUN	6.2	1.0	6.5	5.0	1.5	4.5	2.5	72.9	27
To Others	45	28	46	22	48	88	27	7	

The elements in the row give the variation explained by component itself and from others. For example, the first entry 67 in Table 7 implies that 67 % variation in agricultural growth is explained by agriculture itself. The next entry, 14.2% means that 14.2% variation in the agricultural growth is explained by mining. For agriculture, 67% of the variation in growth is explained by agriculture and 33% by the rest. The elements of the columns show how much the sectors contribute in the variation of the others' growth rate.

Table 8: Forecast error variance decomposition at 10 periods with 4 lags
Sample: 1996:Q2-2014:Q3

	AGR	MIN	MFG	EG&W	CONS	TRAD& TRAN	FINREBS	COMMUN	From others
AGR	37.5	7.6	4.3	14.4	9.3	2.5	9.0	15.4	63
MIN	7.7	23.7	5.9	17.6	13.3	21.3	4.3	6.3	76
MFG	6.1	7.7	26.8	6.3	18.2	24.7	5.4	4.9	73
EG&WS	13.2	5.1	6.9	27.1	14.4	9.3	17.7	6.5	73
CONSTR	3.8	7.7	13.0	8.5	36.2	18.1	7.7	5.0	64
TRAD&TRAN	6.5	13.1	14.7	13.7	16.3	32.3	1.8	1.5	68
FINREBS	5.6	5.0	12.8	2.7	15.5	6.4	47.8	4.2	52
COMMUN	12.2	2.2	13.0	11.5	8.9	2.2	7.6	42.4	58
To Others	55	48	71	75	96	85	53	44	

Comparing Tables 7 and 8, one finds that as we increase the number of lags from 1 to 4, the variation in growth explained by the other sectors (or components) increase considerably. It reflects that the linkages need time to take effect and are not instantaneous. Contemporaneous frameworks may not be able to fully capture the full extent of linkages, such that the relationships can be best understood with an optimum lag length. In understanding the inter-sectoral relations in the Indian case this might be an important way forward.

In both the estimations, with 1 and 4 lags, the variation in growth of FINREBS is least explained by the other sectors. At 1 lag, 82% of variation in FINREBS is explained by FINREBS itself. Even after allowing for 4 lags, 48% variation in FINREBS is explained by FINREBS itself. Agriculture and community are the next two sectors where the interdependence, expectedly, is

weak. Variation in agriculture is typically explained by variation in rainfall, whereas in case of community, the growth is policy determined. Analysis of forecast error variance decomposition corroborates the least association of FINREBS with other components of GDP in terms of growth connectedness.

V. What explains the "autonomous" Growth of FINREBS?

The foregoing analysis raises some fundamental questions. How did FINREBS continue to grow when the other sectors of the economy were performing badly? What are the implications of high growth of FINREBS with weak links to other sectors of the economy? While the full range of answers is beyond the scope of the study, a few exploratory arguments are placed here based on our reading of the Indian economy.

As we saw, FINREBS consists of three sets of services: (a) banking and insurance; (b) ownership of dwellings and real estate; and (c) business services. To the extent, business services include outsourced services and service exports, one may suggest business services have propelled growth. Nagaraj (2008) argues on these lines when he says that higher growth rates between 1992-3 and 2006-7 compared to 1980s in services are due to communication and business services. While this may be one factor, one cannot overlook that in 2012-13, business services accounted for not more than 28% of FINREBS output whereas the remaining 72% comprised of output of banking & insurance and ownership of dwellings and real estate[9] In other words, while business services such as includes services like computer services are significant contributors to gross value added and export earnings, growth of FINREBS cannot be wholly or primarily be attributed to business services atleast during the past decade or so. To understand fully the nature of growth of FINREBS one has to turn towards the dynamics of finance and asset prices.

One of the ways in which modern finance has worked is by creating financial booms, be it asset price booms or credit booms. And lending booms often end in crashes as research has shown.[10] RBI's Financial Stability Report (2013) acknowledges that credit making during 2005 to 2008 boom was associated with less stringent credit appraisal, notwithstanding the regulatory framework. Moreover, after the slowdown in the rest of the economy, as we have noted, FINREBS continued to grow. In what has now become a universal trend, loans to real estate and other sensitive sectors increased. Sensitive sectors include the real estate sector, capital markets and commodity trade. RBI's Report on Trend and Progress of Banking (2013) notes that growth in credit to sensitive sectors almost doubled in 2012-13 primarily on account of credit to real estate, whereas in the past, growth in credit to sensitive sectors generally followed a pattern similar to the growth in overall credit.

In a recent paper, Jorda, Schularick and Taylor (2014) have compared modern banks to real-estate funds in which long-term mortgage lending is funded by short-term borrowing from the public. Borrowed funds from the banking system drive real estate prices and prop up the bank balance-sheets, until market expectations reverse and boom gives way to panic and crash. For the Indian economy, housing price galloped upwards steadily for several years before stabilizing. Certain large real estate firms with massive debt exposure to housing finance companies defaulted on their loans.[11] While the main issue with the financial sector in India is the high defaults on corporate debts, binges in risky lending build vulnerability into the financial sector that could snowball into a crisis at any time.

[9] (Refer to Box: What constitutes FINREBS).
[10] The classic works on the theme are Minsky (1992) and Kindelberger (1978). In the wake of global financial crisis, many researchers have looked at the issues around credit booms and financial crisis closely.
[11] "LIC Housing Finance takes over Orbit Corp's Mumbai property" by Raghavendra Kamath & Mansi Taneja, Business Standard, December 4, 2013.

Economic slowdowns are also periods associated with rise in rent seeking activities in sectors such as land, gold, spectrum licenses (another finite natural resource) using borrowed funds. When demand for finance from manufacturing sector etc. falls in downturns, demand from speculative and rent seeking sectors goes up as economic agents try to maximize returns through buying and selling. The rent-seeking sector however can't sustain itself for long period and ultimately demand from rent seeking sector would also go down, bringing it in sync with the real sector.

Other than real estate, the sectors with the highest level of stressed assets in the Indian economy are infrastructure, mining, iron and steel, aviation and textile sectors. Government interference in terms of pushing bank finance into avenues that were better served by long-term industrial financing institutions is said to be a major contributing factor. Prodded by the government, banks lent to projects involving lumpy, illiquid investments with long gestation lags and relatively high risks typical of these sectors (Chandrasekhar and Ghosh, 2013). Besides, crony capitalism thrived as firms with low capital base managed to get massive sized loans on the basis of political connections. Transparency and accountability in the system were compromised in the attempts to privilege certain big and powerful borrowers. The result has been concentration of bad debt and a large number of willful defaulters.

As at end March 2015, stressed asset ratio of the commercial banks, defined as the ratio of sum of gross NPAs and restructured standard advances to the gross advances of banks stands at 10.9%. For public sector banks the ratio is 13.2%. The share of non-priority sector NPAs has gone up across bank groups. Not surprisingly, credit growth in the Indian economy has slowed. All scheduled commercial banks credit growth on a year-on-year basis in 2014-15 records 9.7%, whereas the average credit growth for the past ten years between 2004-5 and 2013-14 was around 22%. The health of the banking sector is under strain.

What one might consider as mitigating circumstances and therefore would have allowed finance and real estate to grow despite overall economic slowdown, essentially added to the fragility in the system. In other words, the forces that make for the autonomous characterization of FINREBS are the ones that may push the economy into an unstable financial regime.

VI. Conclusion

Since 2005, the FINREBS sector has grown rapidly with its share in GDP rising to around 22% by 2014:Q3. This paper tried to empirically explore the relation of FINREBS with the rest of the sectors of the economy focusing on the period since the late 1990s. Forward linkage from FINREBS to the rest of the economy is found to be below average compared to the rest of the sectors of the economy based on input-output analysis, and backward linkage from FINREBS is amongst the lowest. It is difficult to therefore imagine FINREBS as a `leading sector' in the Hirschman sense.

Rolling cointegration helped in analyzing how the long-term relations among sectoral components have behaved over time, as the much used cointegration method is sensitive to sample choice. An interesting result is the increasing co-movement in output of FINREBS and agriculture and allied activities; however, for most other sectors the association with FINREBS has been insignificant or weak, overall. The variance decomposition of forecast error corroborates that a large percentage of variation in the growth of FINREBS cannot be explained by other sectors of the economy.

Growth in FINREBS (and its divergence from growth trajectories in other sectors) was made possible through a number of mitigating factors such as less stringent credit appraisal and lending to sensitive sectors, while crony capitalism played its part with banks overextending themselves to lend. These same forces, however, eventually weakened the system. It is fallout of the imbalance that the system today is saddled with huge bad debt, large companies as willful defaulters and drastic slowdown in lending activities in the economy.

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