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Inter-Sectoral Linkages in Jammu & Kashmir Economy — An Econometric Analysis§

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Abstract

The study has explored econometrically the linkages between different sectors of the economy of Jammu & Kashmir state through co-integration approach and state space model on the net state domestic product (NSDP) data collected from the designated published sources for the period 1970-71 through 2013-14.The study has revealed that primary sector registered a sustained decline in NSDP share, from 40.6 to 25.2 per cent, followed by the secondary sector which too has registered a decline after 1990 from 23.7 per cent to 9.2 per cent. However, the services sector has shown an upward trend from 38.5 per cent to 65.6 per cent during the study period. Some of the ECM equations have revealed even more than 90 per cent of the adjustments every year. The results of the state space model have suggested that over time, the dependence of primary sector on secondary and tertiary sectors (excluding CSPS) has decreased, while the dependence of primary sector on tertiary sector has increased.

Key words: Econometric analysis, economic development, intersectoral linkages, agriculture, industry and services, Jammu & Kashmir

JEL Classification: Q16, Q13

Introduction

A structural shift from agricultural sector towards services and manufacturing sectors is expected to take place with the increase in the Net State Domestic Product (NSDP) owing to their higher elasticity. This shift brings significant changes in the production process and consumption expenditure, in addition to some other social indicators like education, health care, etc. The question, therefore, is whether agriculture is more important for the acceleration of economic growth or industry should be considered as the engine of this growth? Also, how tertiary sector is linked up with these two sectors is an issue in the development process. Among the production and consumption linkages, the later is more powerful and addition of 1 per cent growth in the agricultural sector brings about 0.5 per cent growth in the industrial sector (Rangarajan, 1982). The complementarity between industrial and services sectors, and linkages from services to industry are strong and reflect the use of service sector inputs in industry (Hansda, 2001). The inter-sectoral relationships and production linkages corroborate that in about a quarter of a century, the modernised agriculture has enhanced the dependence of agriculture

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on the industry for inputs. Under the services sector, the movement of production linkages from the late-1960s to early-1990s was moderately in favour of agriculture and sharply in favour of services sector. On demand linkages, it is observed that a fall in agricultural income reduces the demand for agricultural machinery and other industrial products, resulting in a fall of aggregate demand and vice versa (Sastry *et al.,* 2003). Under the granger causality framework, no evidence of relationship was moderately found between primary and secondary sectors; however, under the co-integration framework, strong evidence of existence of long-run equilibrium relationship was found among the primary, secondary and the specialised services sectors (Bathla, 2003).

With this background, this study has looked into the economy of the state of Jammu & Kashmir and has econometrically analyzed its sectoral linkages in order to identify the positive growth stimuli to prioritize the sources of growth through exploiting niche areas for development.

Data and Methodology

The study is based on the secondary data for the 40-year period, from 1970-71 to 2013-14, on various sectors and sub-sectors of the economy, viz. primary sector (Agriculture), which includes crops, horticulture, livestock, fisheries and forestry; secondary sector (Industry), which includes mining & quarrying, manufacturing, electricity, gas and water and tertiary sector (Services), which includes, construction, transport, trade, real estate, community and social services, collected from the published sources of the Directorate of Economics and Statistics, (Govt. of Jammu & Kashmir), Reserve Bank of India , Planning Commission of India, etc. The compound growth rates for various decades were computed and instability index proposed by Ray (1983a), Ray (1983b), Dev (1987), Rao *et al.* (1988) and Chand and Raju (2009) was computed by formula (1):

$$\text{Instability index} = \text{Standard deviation of natural logarithm } (Y_{t+1}/Y_t) \quad \ldots(1)$$

where, Y_t is the NSDP in the current year and, Y_{t+1} is for the next year. This index is unit free and robust, and measures deviation from the underlying trend (log linear in this case). When there are no deviations from the trend, the ratio of Y_{t+1}/Y_t is constant and thus standard deviation is zero. The wider the series fluctuates, the more does the ratio of Y_{t+1} and Y_t fluctuate, increasing the standard deviation. Johansen's (1988) multivariate Cointegration approach was used to examine cointegration between the two price indices. Before conducting cointegration test, it is mandatory to perform stationarity test. Augmented Dickey-Fuller (ADF) unit root test (Dickey and Fuller, 1979), Philips Perron (PP) test (Philips and Perron, 1988) and Kwiatkowski, Phillips, Schmidt and Shinn (KPSS) unit root test (Kwiatkowski *et al.*, 1992) were also performed to check for stationarity in all the series.

After establishing the long-run equilibrium relationship among the variables, an attempt was made to test the stability of the model and to understand the impact of changes in one sector on the other sectors over time through the state space model (Kaur *et al.,* 2009) using Kalman filter (1960).

Results and Discussion

Structure and Growth of Output: Sectoral Analysis

Prior to analysing the sectoral linkages in J&K economy, it was considered useful to review the changes in the sectoral composition of the NSDP, in terms of share of agriculture and allied activities, industry and services sector. The sectoral shares, at 2004-05 prices, were computed and are presented in Table-1.The figures reveal that the average share of Primary sector(Agriculture /Horticulture/ livestock, fisheries, others) have declined from 40.60 to 31.30; 31.30 to 29.50 and 29.50 to 25.2 per cent respectively from 1970-71 to 1980-81; 1980-81 to 1990-91; 1990-91 to 2000-01 and from 2001 to 2013. Against this the average share of industrial sector increased from 20.90 per cent in 1970-71 to 23.70 in 1980-81 to 1990-91 but reduced significantly thereafter to 9.2 per cent during 2000-01 to 2013-14. Compared to this the services sector witnessed a continuous expansion with its share in total income rising from 38.5 per cent to 65.6 per cent over time. From the above sectoral analysis it can be concluded that the share of agriculture and allied activities and industry has been declining, while that of service sector has increased substantially, thereby demonstrating a skewed pattern of economic growth in favour of service sector.

The analysis of inter-sectoral linkages within the economy provides a better input for pragmatic policy

Table 1. Sector-wise average share of state NSDP, 1970-2013

(in per cent)

Sector	1970-71 to 1980-81	1981-82 to 1990-91	1991-92 to 2000-01	2001-02 to 2013-14
Primary sector (Agriculture)	40.6	31.3	29.5	25.2
Crops, horticulture & livestock	32.3	24.4	23.7	20.1
Forestry & logging	7.7	6.2	5.0	4.6
Fishing	0.6	0.7	0.8	0.5
Secondary sector (Industry)	20.9	23.7	11.1	9.2
Mining & quarrying	0.2	0.2	0.2	0.3
Manufacturing	3.6	3.9	4.1	6.2
Electricity, gas & water supply	17.1	19.6	6.8	2.7
Teritiary sector (Services)	38.5	45	59.4	65.6
Construction	11.4	10.7	16.0	15.5
Transport, storage and communication	3.4	0.9	1.5	4.5
Trade, hotels & restaurants	5.9	7.9	7.0	7.8
Real estate, banking & insurance	4.4	9.6	9.5	10.0
Community, social & personal services	13.4	15.9	25.4	27.8

Table 2. Sector-wise average growth trends

(in per cent)

Particulars	1970-71 to 1979-80	1980-81 to 1989-90	1990-91 to 1999-00	2000-01 to 2013-14
Primary sector (Agriculture)	3.6	-1.5	5.2	2.2
Crops, horticulture , & livestock	2.2	0.8	3.5	2.6
Forestry & logging	9.1	-10.1	17.0	0.4
Fishing	6.8	2.3	4.8	1.8
Secondary sector (Industry)	2.9	7.6	-16.4	6.5
Mining & quarrying	-1.2	4.5	8.9	19.4
Manufacturing	3.2	6.7	2.7	12.2
Teritiary sector (Services)	5.1	4.0	6.6	6.5
Construction	3.8	3.4	8.7	6.1
Transport, storage and communication	-9.5	11.9	14.1	11.7
Trade, hotels & restaurants	12.5	-1.9	4.4	6.8
Real estate, banking &insurance	12.2	1.8	2.5	6.8
Community, social & personal services	5.1	4.0	6.6	6.5
NSDP at factor cost	4.0	3.0	3.1	5.4

framework with respect to altering the sectoral composition of the NSDP. The sectoral composition itself determines the sources of growth within a particular sector for exploitation of the unexploited potential necessary for pushing the overall growth in the economy. The decadal analysis of the economy of Jammu & Kashmir, presented in Table 2, reveals that the NSDP exhibited a remarkable jump in the growth from 3.1 per cent to 5.4 per cent from1990-99 to 2000-13. The significant increase in NSDP could be attributed to the revival of the growth of industrial sector and sustained growth experienced by the service sector driven by sub-sectors like trade, hotels, real estate, banking and insurance.

Table 3. Instability index for different sectors of J&K economy

(in per cent)

Particulars	1970-71 to 1979-80	1980-81 to 1989-90	1990-91 to 1999-00	2000-01 to 2013-14
Primary sector (Agriculture)	8.0	13.9	6.0	1.9
Crops, horticulture including livestock	**11.4**	**12.5**	**6.5**	**2.8**
Forestry &logging	24.9	36.9	57.4	5.6
Fishing	13.3	3.1	8.7	3.4
Secondary sector (Industry)	11.1	20.2	63.9	8.3
Mining & quarrying	49.6	57.1	79.4	12.0
Manufacturing	12.0	24.0	13.6	13.1
Tertiary sector (Services)	4.4	4.9	4.1	2.6
Construction	12.8	12.4	20.2	7.1
Transport, storage and communication	67.6	22.1	22.4	11.0
Trade, hotels & restaurants	22.8	10.0	5.7	5.1
Real estate, banking & insurance	33.1	10.4	4.2	5.1
Community, social & personal services	6.5	6.1	5.1	6.0
NSDP at factor cost	4.7	4.7	3.0	1.4

To access the fluctuations in the growth, the instability index suggested by Ray (1983), was used to capture the volatility in various sectors and sub-sectors of the state economy. The results, documented in the Table 3 , reveal that during 1970-1979 and 1990-1999, among the three main sectors of the economy, the services sector registered the highest growth rate and exhibited the lowest instability of 4.4 per cent and 4.1 per cent, respectively.

During 1980-1990 and 2000- 2013, the industrial sector registered the highest growth rate and recorded the highest instability of 63.9 per cent and 8.3, per cent, respectively. During the entire study period (1970-71 to 2013-14), the industrial sector showed the highest instability, followed by agriculture and allied sector. The overall results reveal that among all the sectors, the service sector emerged as the least volatile and most stable sector. This sector contributed more than 60 per cent to the state income and experienced sustained growth during the past few decades.

Econometric Analysis of Inter-Sectoral Linkages in Jammu & Kashmir

The pattern of structural change in the economy of J&K, demanded identification of the linkages among the major sectors of the state economy for defining the growth parameters in the hill state. The long-run relationships among the different sectors and their short-run error correction mechanism were examined through multivariate framework using cointegration and vector error correction model. Since cointegration can be done only with those variables that are integrated of the same order, therefore we tested all the log-transformed variables for the presence of unit roots or non-stationarity using Augmented Dickey-Fuller (ADF) test, Phillips-Perron (PP) test and Kwiatkowski, Phillips, Schmidt and Shinn (KPSS) unit root test. The results presented in Table 4 suggest that all the variables were non-stationary at level and therefore the null hypothesis of unit root could not be rejected. However, at first difference, null hypothesis of unit root was rejected for all the variables and all the variables were stationary.

Long-Run Analysis Based on Cointegration Tests and Error Correction Model (ECM)

The cointegration technique was followed to determine long-run relationships among variables. However, to test cointegration among the variables, two main techniques, Engle and Granger (1987) approach and Johansen (1988) approach are usually followed. The Engle-Granger method is primarily used to test a unique cointegrating relationship, while the Johansen-Juselius method can be applied to test the existence of more than one co-integrating relationship.

Table 4. Unit root test using ADF, PP and KPSS tests

Sector	At level				At first difference			
	Optimum lag length	ADF test	PP test	KPSS test	Optimum lag length	ADF test	PP test	KPSS test
(A) Primary sector (Agriculture)								
Agriculture crops, horticulture including livestock	1	0.822	0.837	0.798	0	-9.009	-9.645	0.268
Forestry &logging	2	-1.817	-1.708	0.741	1	-8.101	-8.133	0.077
Fishing	1	-1.229	-1.225	0.814	0	-5.692	-5.657	0.103
Sub-total (A)	1	-0.271	-0.292	0.806	0	-9.175	-9.887	0.167
(B) Secondary sector (Industry*)								
Mining & quarrying	1	1.139	1.179	0.560	0	-33.028	-3.305	0.445
Manufacturing	2	1.459	1.539	0.660	0	-4.575	-5.255	0.391
Sub-total (B)	1	-2.269	-1.646	0.741	0	-3.959	-5.054	0.112
(C) Tertiary sector (Services)								
Construction	1	0.182	-0.362	0.769	0	-4.915	-4.910	0.096
Transport, storage and communication	2	1.331	1.013	0.563	1	-2.972	-5.594	0.327
Trade, hotels & restaurants	1	2.393	2.540	0.767	0	-3.782	-3.769	0.421
Real estate, banking & insurance	2	2.810	2.906	0.797	0	-4.466	-4.635	0.432
Community, social & personal services	1	2.299	2.741	0.806	0	-3.852	-3.923	0.453
Sub-total (C)	1	1.282	0.148	0.843	0	-3.596	-6.420	0.063
Tertiary excluding CSPS	1	-0.482	-0.511	0.820	0	-5.918	-5.947	0.074
Total (A+ B+C)	1	1.597	1.948	0.752	0	-5.515	-5.510	0.175

*Industry includes electricity, gas and water also.

The number of cointegrating vectors based on Johansen-Juselius method could be determined by applying the Trace statistic and the Maximal Eigen value statistic.

For assessment of cointegration, the order of stationarity was determined and the variables were found stationary at first difference, i.e. all the series were of I(1) order. The VAR model was used to choose the optimal lag length using AIC criteria. The number of cointegrating vectors was determined to establish cointegrating relationships among the major sectors, viz. primary, secondary and tertiary sectors and then the relationship of certain sub-sectors of the secondary and tertiary sectors was explored with other sectors.

The empirical results of the cointegration tests based on Johansen-Juselius (1990) method using trace and maximum Eigen value test statistic are presented in Table 5. Both the Trace statistic and Maximum Eigen value statistic indicated the existence of one cointegrating relationship among the sectors. In the process, we found seven cointegrating relationships among various sectors and sub-sectors of the economy. The long-run equations along with short-run dynamics (ECM equations) for the period 1980-81 to 2012-13 for various sectors and their contributions were estimated. Since in a co-integration analysis, it is not possible to interpret the magnitude of estimated coefficients, we considered the estimated parameters that provide information about the speed of adjustment of each variable towards the long-run equilibrium after a short-run shock by using ECM.

The results of the trace and maximum Eigen value test statistic revealed that there existed one co-integrating relationship among primary and secondary sectors; primary and tertiary sectors; secondary and tertiary sectors; primary and manufacturing sectors; primary and tertiary sectors (excluding CSPS); primary, secondary and tertiary sectors; and primary, secondary and tertiary sectors (excluding CSPS). The ECM estimates (Tables 6-8) further revealed that the state

Table 5. Empirical results of the co-integration tests based on Johansen-Juselius method

Hypothesized No. of CE(s)	Eigen value	Max-Eigen statistic	Critical value at 5% level	Probability	Trace statistic	Critical value at 5% level	Probability	Inference
Primary and secondary sectors								
None	0.518	29.218	19.387	0.0014	42.530	25.872	0.0002	One co-integrating
At most 1	0.283	13.312	12.517	0.0568	13.312	12.517	0.0568	relationship exists.
Max-Eigen value and Trace test indicate 1 cointegrating equation at 0.05 level								
Primary and tertiary sectors								
None	0.434	22.766	19.387	0.0155	34.520	25.872	0.0033	One co-integrating
At most 1	0.255	11.753	12.517	0.0669	11.753	12.517	0.0669	relationship exists.
Max-Eigen value and Trace test indicate 1 cointegrating equation at 0.05 level								
Secondary and tertiary sectors								
None	0.3576	17.703	23.975	0.0864	30.516	31.153	0.0123	One co-integrating
At most 1	0.2740	12.813	16.553	0.0546	12.813	16.553	0.0546	relationship exists.
Max-Eigen value and Trace test indicate 1 cointegrating equation at 0.05 level								
Primary and manufacturing sectors								
None	0.520	27.200	19.387	0.0030	34.962	25.872	0.0028	One co-integrating
At most 1	0.189	7.7623	12.517	0.2717	7.7623	12.517	0.2717	relationship exists.
Max-Eigen value and Trace test indicate 1 cointegrating equation at 0.05 level								
Primary and tertiary sectors (excluding CSPS)								
None	0.670	45.469	19.387	<0.0001	56.619	25.872	<0.0001	One co-integrating
At most 1	0.238	11.149	12.517	0.0837	11.149	12.517	0.0837	relationship exists.
Max-Eigen value and Trace test indicate 1 cointegrating equation at 0.05 level								
Secondary and tertiary sectors (excluding CSPS)								
None	0.197	8.3579	14.264	0.3435	8.874	15.494	0.3771	No co-integrating
At most 1	0.013	0.5168	3.841	0.4722	0.516	3.8414	0.4722	relationship exists.
Max-Eigen value and Trace test indicate 0 cointegrating equation at 0.05 level								
Primary, secondary and tertiary sectors								
None	0.720	52.225	25.823	<0.0001	75.418	42.915	<0.0001	One co-integrating
At most 1	0.308	15.125	19.387	0.1869	23.193	25.872	0.104	relationship exists.
At most 2	0.178	8.067	12.517	0.2462	8.067	12.517	0.2462	
Max-Eigen value and Trace test indicate 1 cointegrating equation at 0.05 level								
Primary, secondary and tertiary sectors excluding (excluding CSPS)								
None	0.516	27.596	21.131	0.0054	43.352	29.797	0.0008	One co-integrating
At most 1	0.275	12.221	14.264	0.1026	15.755	15.494	0.0557	relationship exists.
At most 2	0.088	3.534	3.841	0.0601	3.534	3.8414	0.0601	
Max-Eigen value and Trace test indicate 1 cointegrating equation at 0.05 level								
Banking, manufacturing and primary sectors								
None	0.428	21.227	25.823	0.1802	39.272	42.915	0.1104	No co-integrating
At most 1	0.288	12.916	19.387	0.3348	18.045	25.872	0.3409	relationship exists.
At most 2	0.126	5.128	12.517	0.5781	5.128	12.517	0.5781	
Max-Eigen value and Trace test indicate 0 cointegrating equation at 0.05 level								
Trade and manufacturing sectors								
None	0.346	16.145	19.387	0.1391	23.355	25.872	0.0997	No co-integrating
At most 1	0.172	7.2101	12.517	0.3231	7.210	12.517	0.3231	relationship exists.
Max-Eigen value and Trace test indicate 0 cointegrating equation at 0.05 level								

Note: CSPS= Community, social and personal services.

Table 6. Reduced form of error correction estimates: 1970-71 to 2013-14

Primary and secondary sectors				
Co-integration equation	D(LOG(SECON$_{t-1}$))	D(LOG(PRIM$_{t-1}$))	ECM$_{t-1}$	Adj. R square
D(LOG(PRIM$_t$))	0.081	-0.401	0.005	0.213
Primary and tertiary sectors				
	D(LOG(TERT$_{t-1}$))	D(LOG(PRIM$_{t-1}$))		
D(LOG(PRIM$_t$))	0.223	-0.230	-0.277	0.742
Secondary and tertiary sectors				
	D(LOG(TERT$_{t-1}$))	D(LOG(SECON$_{t-1}$))		
D(LOG(SECON$_t$))	-1.242	0.345	-0.156	0.317
Primary and manufacturing sectors				
	D(LOG(MFG$_{t-1}$))	D(LOG(PRIM$_{t-1}$))		
D(LOG(PRIM$_t$))	0.067	-0.186	-0.133	0.834
Primary and tertiary sectors (excluding CSPS)				
	D(LOG(TERT_CSPS$_{t-1}$))	D(LOG(PRIM$_{t-1}$))		
D(LOG(PRIM$_t$))	0.456	0.020	-0.910	0.732

Table 7. Reduced form of error correction estimates: 1970-71 to 2013-14

Primary, secondary and tertiary sectors					
	D(LOG(PRIM$_{t-1}$))	D(LOG(SECON$_{t-1}$))	D(LOG(TERT$_{t-1}$))	ECM$_{t-1}$	Adj. R-square
D(LOG(PRIM$_t$))	0.107	0.106	0.127	-0.910	0.843
Primary, secondary and tertiary sectors (excluding CSPS)					
	D(LOG(PRIM$_{t-1}$))	D(LOG(SECON$_{t-1}$))	D(LOG(TERT_CSPS$_{t-1}$))		
D(LOG(PRIM$_t$))	-0.054	0.092	0.110	-0.805	0.812

Table 8. Estimates of long-run relationships: 1970-71 to 2013-14

Primary and secondary sectors		
	Constant	LOG(SECON$_t$)
LOG(PRIM$_t$)	3.246	0.127
Primary and tertiary sectors		
	Constant	LOG(TERT$_t$)
LOG(PRIM$_t$)	1.965 (0.075)	0.438 (0.019)
Secondary and tertiary sectors		
	Constant	LOG(TERT$_t$)
LOG(SECON$_t$)	2.746 (0.317)	0.150(0.061)
Primary and manufacturing sectors		
	Constant	LOG(MFG$_t$)
LOG(PRIM$_t$)	2.497 (0.080)	0.416 (0.026)
Primary and tertiary sectors (excluding CSPS)		
	Constant	LOG(TERT_CSPS$_t$)
LOG(PRIM$_t$)	1.991(0.123)	0.459 (0.033)

Note: Figures within the parentheses are standard errors
Prim = Primary; SECON = Secondary; TERT = Tertiary; MFG = Manufacturing

corrects approximately 0.5 per cent; 28.0 per cent; 16.0 per cent; 13.0 per cent; 91.0 per cent; 91.0 per cent and 80.0 per cent of their errors every year, respectively, under the above sectors.

The relationship between primary and tertiary sectors, after excluding the community, social and personal services (CSPS) from the tertiary sector, was also explored. The rationale for excluding CSPS from the tertiary sector in our analysis emanates from the fact that a major part of the CSPS comprises wages and salaries of the government administrative departments, which is policy driven and as such does not directly enter the productive activities of the economy. The negative sign of the estimated coefficient in respect of the secondary sector (Table 9) suggests that secondary and primary sectors move in the opposite direction in the long-run. This finding is against the belief that all the sectors in an economy move in the same direction, at least in the long-run.

Table 9. Estimates of long-run relationships: 1970-71 to 2013-14

	Primary, secondary and tertiary sectors		
	Constant	LOG($SECON_t$)	LOG($TERT_t$)
LOG($PRIM_t$)	2.053 (0.187)	-0.025 (0.054)	0.439 (0.030)
	Primary, secondary and tertiary sectors (excluding CSPS)		
	Constant	LOG($SECON_t$)	LOG($TERT\_CSPS_t$)
LOG($PRIM_t$)	2.113 (0.202)	-0.045 (0.034)	0.467 (0.035)

Note: Figures within the parentheses are standard errors

State Space Model

State space model using Kalman filter was used to assess the impact of changes in one sector(s) on the other sectors over time. The estimates of state space model were obtained by maximizing the log-likelihood function through a recursive algorithm. We considered seven frameworks, based on the co-integrating relationships.

Primary and Secondary Sectors

The first state space model was run with primary sector income being dependent only on the secondary sector income (Chart I). The standard errors for both constant term and secondary sector exhibited a consistent declining trend. The coefficient of the constant term demonstrated a decreasing trend up to early-1980s and increasing trend thereafter (Chart I), suggesting a probable increased productivity in agriculture since late-1980s. Further, the coefficient for manufacturing showed a declining trend over time, indicating the lower or no dependence of agriculture and allied sector on the manufacturing sector during the period under discussion.

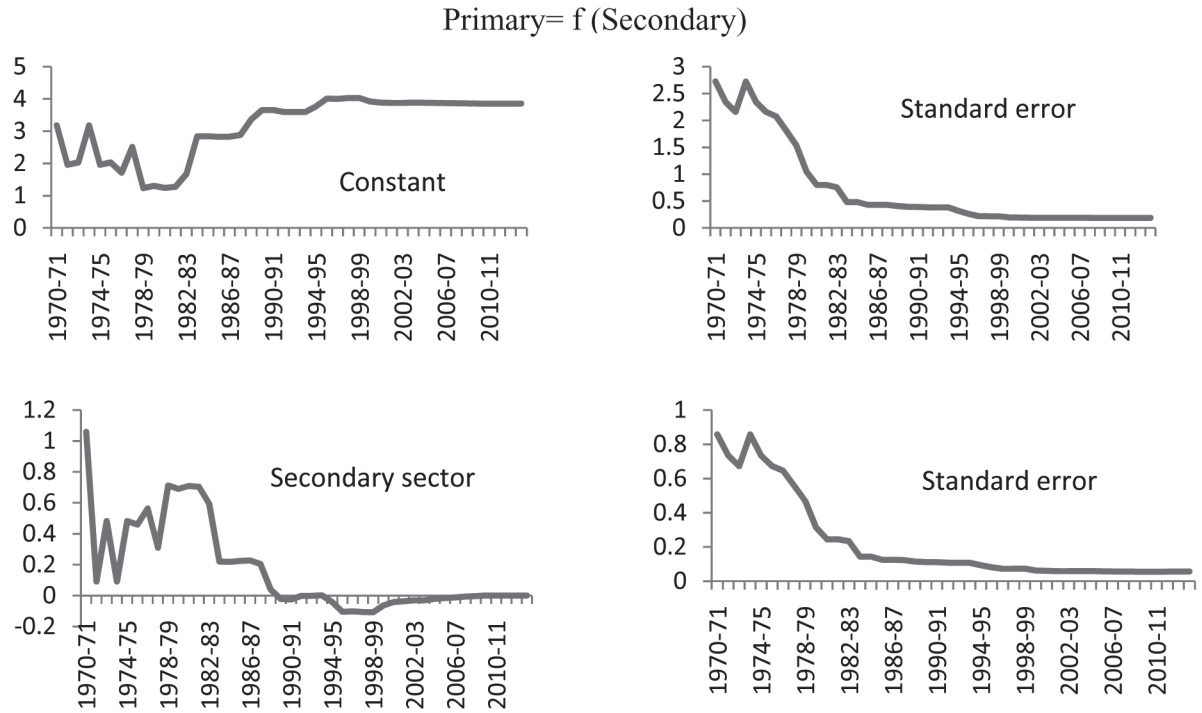

Chart I

Primary and Tertiary Sectors

The second state space model was specified with the primary sector dependent on tertiary sector. The estimates of coefficients along with the standard errors of parameters, are presented in Chart II. The estimate of standard errors for the parameters indicated stability of the model. While the coefficient of the constant term showed by and large a constant trend, the coefficient of the tertiary sector exhibited an increasing trend, suggesting dependence of agriculture and allied activities on the tertiary sector (Chart II).

Secondary and Tertiary Sectors

At the third stage analysis, the secondary sector output was considered as a function of the tertiary sector. The estimates of coefficient of parameters and the standard errors over the period are presented in Chart III. Small estimates of the standard errors realised

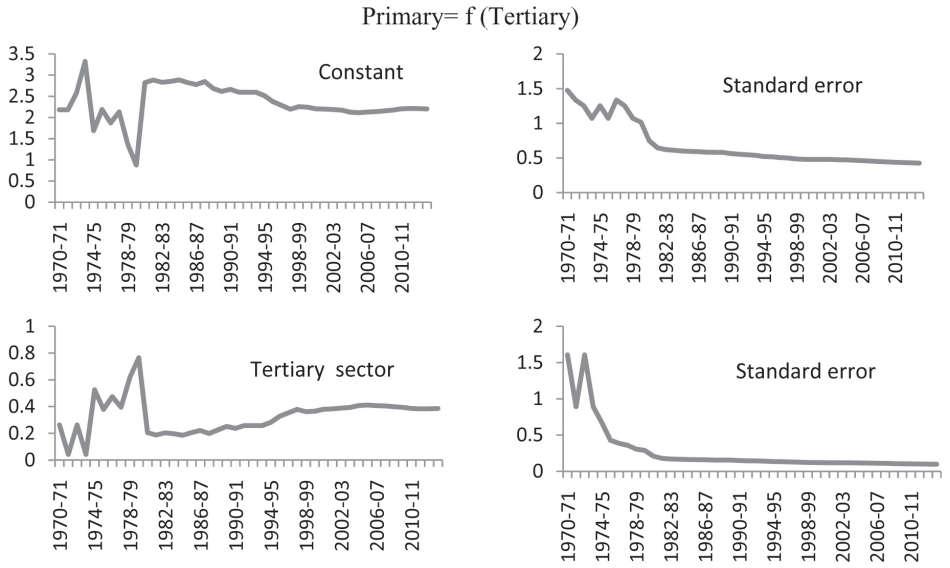

Chart II

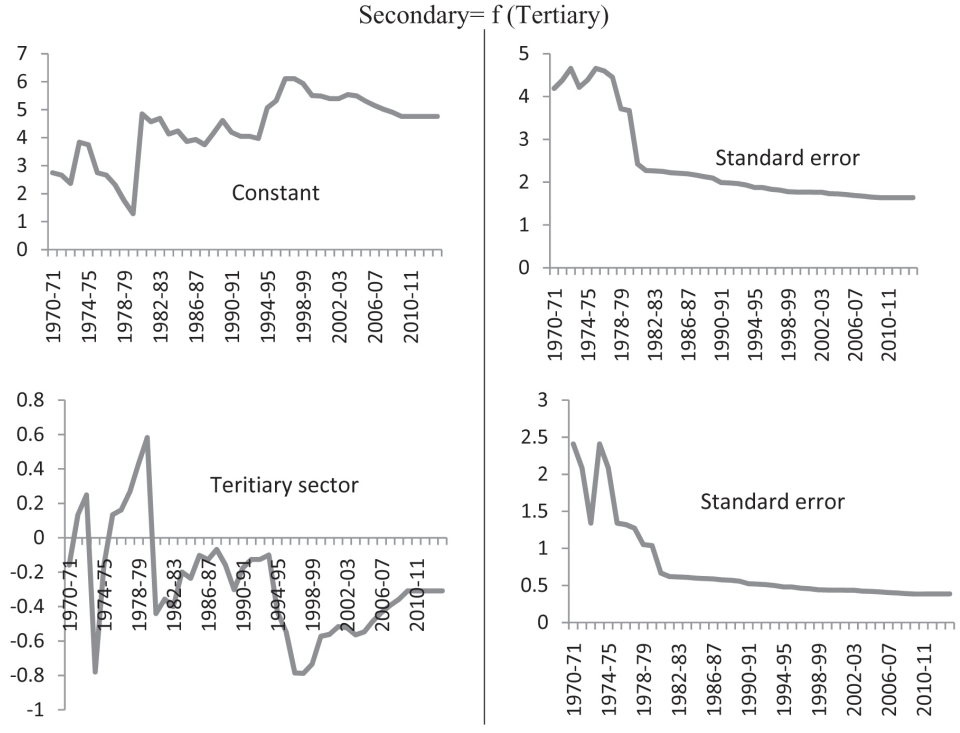

Chart III

for all the parameters indicated a stability of the estimates. The coefficient of tertiary sector showed an increasing trend since late-1990s, suggesting that this sector supported the secondary sector output.

Primary, Secondary and Tertiary Sectors

The fourth analysis was carried with the primary sector output dependent on secondary and tertiary sectors. The estimate of the standard errors showed a tendency towards approaching zero over time for all the parameters, except that estimate of the secondary sector depicted a tendency towards stability. The coefficient of secondary sector showed a significant decline in trend, thereby suggesting its declining influence on the primary sector performance (Chart IV).

Primary and Manufacturing Sectors

In fifth analysis, the primary sector output was assumed to be dependent on the manufacturing sector. The small estimates of the standard error obtained over the time for both the constant term and manufacturing sector implied a tendency towards stability. The coefficient of the manufacturing sector showed an

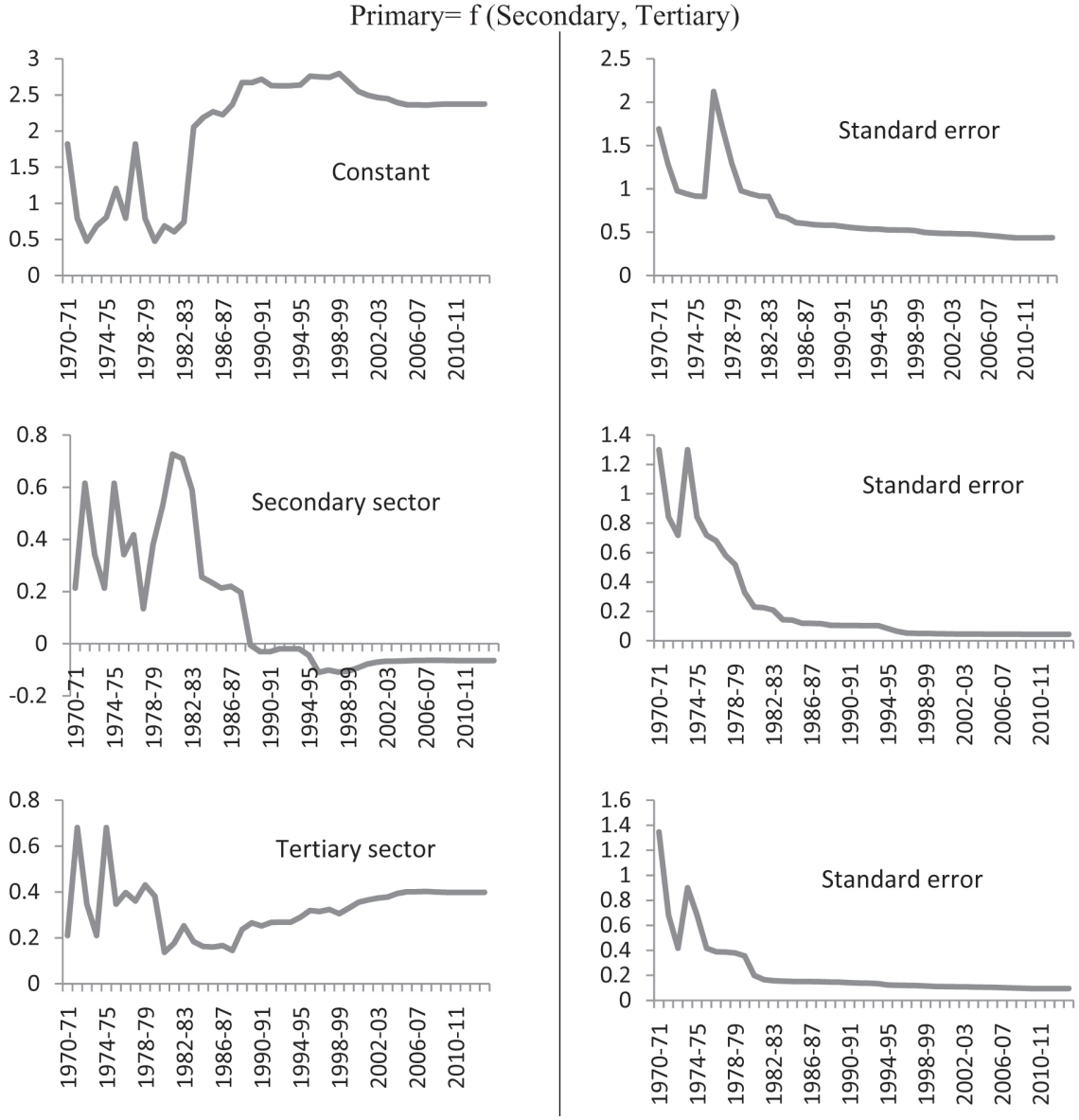

Chart IV

erratic behaviour, though with an increasing trend since early-1990s, suggesting its increasing influence on the primary sector performance (Chart V).

Primary and Tertiary Sectors (excluding CSPS)

The primary sector output was assumed to be dependent on the tertiary sector (excluding CSPS) in the sixth analysis. The estimates of the standard error over time for both constant term and tertiary sector (excluding CSPS) were small, implying a tendency of the estimates towards stability. The coefficient of tertiary sector (excluding CSPS) revealed a decreasing trend, indicating a declining influence of the tertiary sector (excluding CSPS) on the primary sector performance over time (Chart VI).

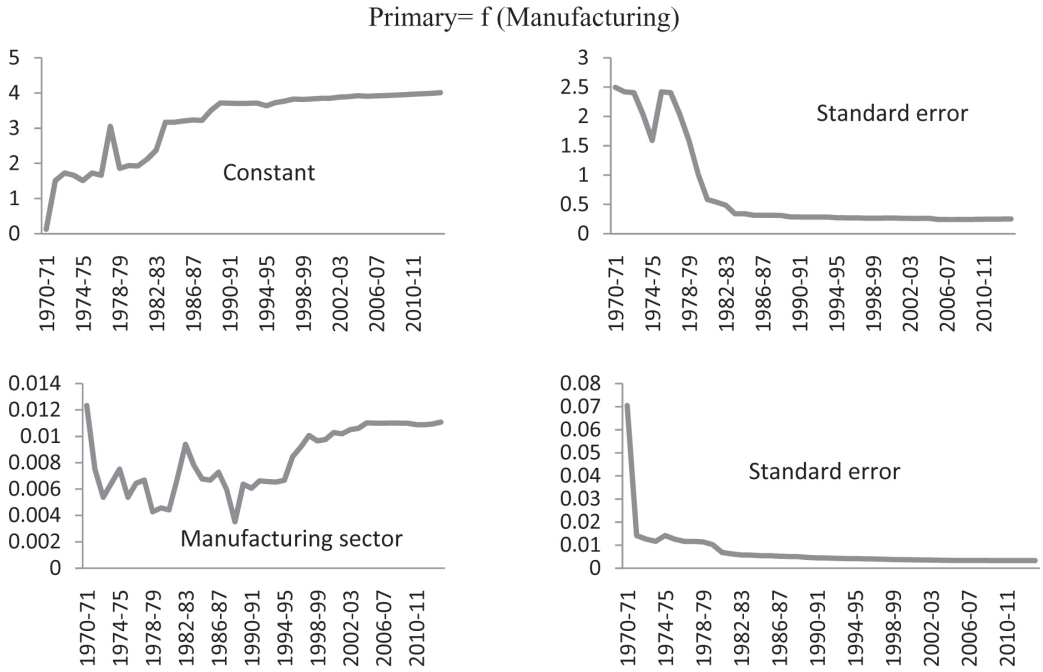

Chart V

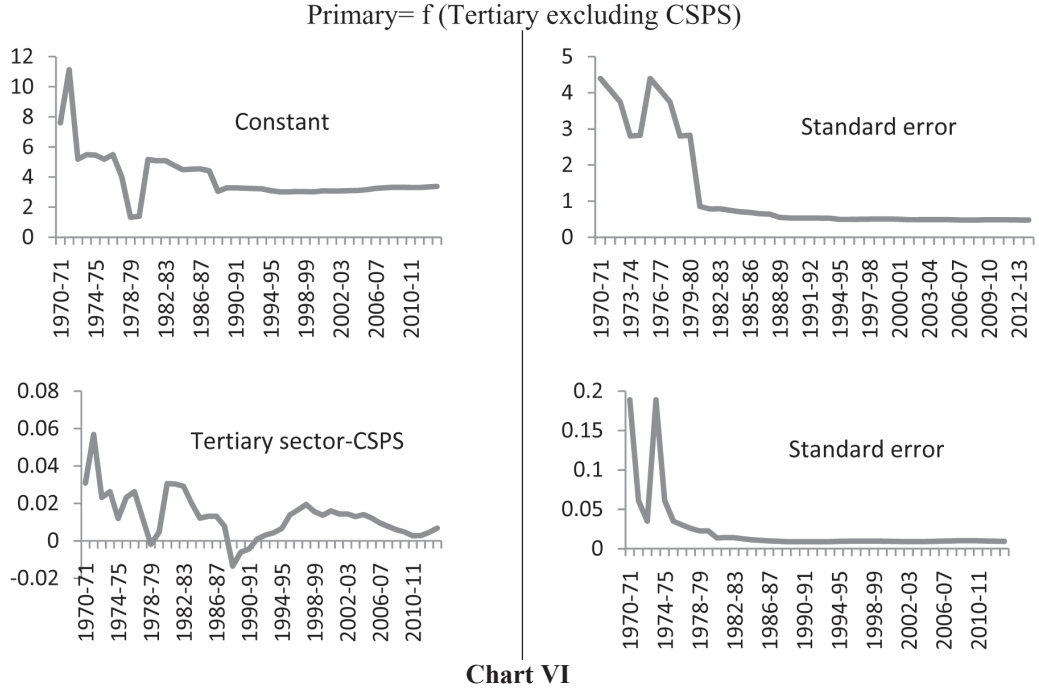

Chart VI

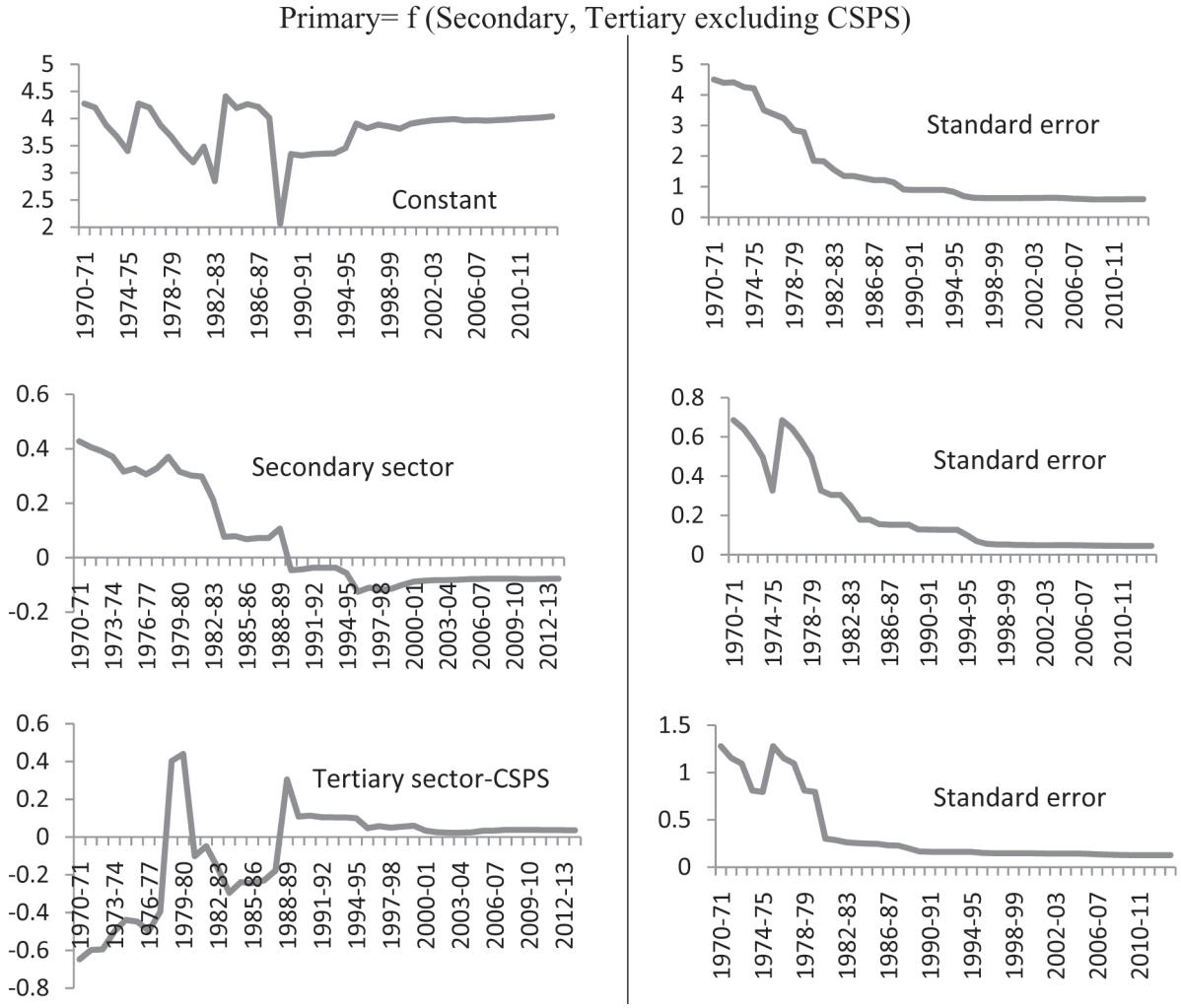

Chart VII

Primary, Secondary and Tertiary Sectors (excluding CSPS)

In the seventh analysis, the primary sector output was considered dependent on the secondary and tertiary sector (excluding CSPS). The coefficient of secondary sector exhibited a decreasing trend, suggesting that the influence of secondary sector on primary sector performance was declining with time, while that of services sector (excluding CSPS) showed an erratic trend (Chart VII).

Conclusions

The study has econometrically analyzed the intersectoral linkages in Jammu & Kashmir economy using cointegration and state space model. The study has found that primary sector had a sustained decline in its contribution towards NSDP which was also true for the industrial sector. The tertiary sector, however, has shown a substantial growth over a period of time. Though the modern agriculture is expected to have a strong association with the industrial sector for using advanced technologies and improved machinery, the deceleration in the growth of industrial sector after 1990s has demonstrated a weak relationship among the sectors. Therefore, the demand linkages of industry vis-a-vis. agricultural sector have significantly weakened and that of services sector with the industrial sector have strengthened over time.

The cointegration analysis among the three main sectors, viz. primary, secondary and tertiary of the economy has exhibited a strong long-run relationship, which has also been found true in one-to-one framework of these sectors, except the primary and

tertiary sector (excluding CSPS). No long-run relationship has been found at the sub-sectoral level. Some of the ECM equations have revealed even more than 90 per cent of the adjustments every year. The conclusion drawn from the state space model is that the dependence of primary sectors on secondary and tertiary sectors (excluding CSPS) has decreased over time, while the dependence of primary sector on tertiary sector has increased. The results drawn from the state space model are, by and large, in consonance with the cointegration results.

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