SECTOR GROWTH IMPACTS ON ECONOMIC DEVELOPMENT OF INDIA

Lalanie P.P.[1]

Abstract

India is still in the early stage of development and therefore inter-sectoral linkage analysis is of timely importance to reach higher economic development levels with a proper institutional set up and policy of the country. This paper explores inter sectoral growth linkages among the agriculture, industry, service, and the export of India and identifies the role of each sector growth in the economic development of the country. Vector Auto Regression (VAR) model based on Johansen co-integration method was employed along with Granger Causality Test in order to examine inter sectoral linkages of India by using data from year 1961 to year 2017. On one hand, it was shown that the agriculture sector had provided a positive impact on the service sector growth with a comparatively large magnitude in the Indian economic development. The export growth also had made a positive link to the agriculture sector growth. On the other hand, India's industry and service sectors did not make any spillover on the other sectors to stimulate its economic development except their direct impact through their own growths. Therefore, India's strongest sector in making links with other sectors is the agriculture sector followed by the external sector (export).

Keywords: Sector Growth, Economic Development, Inter Sectoral Linkage, India

---

[1] Senior Lecturer, Department of Business Economics, Faculty of Management Studies and Commerce, University of Sri Jayewardenepura, Sri Lanka. E-mail: priyanthal@sjp.ac.lk

1. Introduction

No longer do all the countries follow the common path that the developed countries took in their economic growth and development. Nevertheless, one of the common phenomena in the development process is that as economies move towards higher development levels, agricultural sector declines in the share of national GDP and employment while the industry sector and the service sector grow respectively or in a different way. Because of this phenomenon, people do not give proper and enough consideration to the agriculture sector in their development policies (Timmer, 2002 & 2012; Kim and Lee, 2003; Anderson, 2008 etc.). In line with those views, numerous economic development studies discovered that the role of agricultural sector was vital in the economic growth and development, especially at the initial stages of economic growth and development (Lewis, 1954; Kuznets, 1971; Timmer, 1988; OECD, 1999; Harrington, 2005; Cervantes-Godoy and Brooks, 2008; Cervantes-Godoy and Dewbre, 2010 etc.). The economic growth and development process require a rapid transformation in the economic structure to convert to a modern industrial and service economy. This should be backed by a strong value-added agricultural sector since elevated agricultural income can fuel the growth of the industry and service sectors at the process of transformation of the economies from poor subsistence agriculture dominated economies to industrialized modern economies.

Therefore, the main objective of this paper is to identify the roles of the main sectors in the economic growth and development through exploring inter sectoral linkages among the main sectors; the agriculture sector, industry sector, service sector, and the external (export) sector in the emerging South Asian country "India." Harrington (2005), Chebby and Lachaal, (2006), Hye (2009), and Gaspar, Pina and Simoes (2014) emphasized the importance of agricultural sector on the economic growth in New Zealand, Tunisian, Pakistan, and Portugal economies, respectively in the processes of their development. Unlike those researches, this paper examines the importance of sector linkages among the main sectors of India to enhance economic growth and development of the country as the only emerging economy among the SAARC (South Asian Association for Regional Cooperation) countries. Starting from early 1980s, the country records an average annual GDP growth rate above five percent and in most of the years, the GDP growth rate is remarkable and above seven percent (see the Appendix 2). However, though the GDP growth rate is above its comparators in the SAARC region, still the GDP per capita growth rate of India is in an average among those of comparator countries (see the Appendix 2).

There were several studies which attempted to identify the inter-sectoral linkages between the economic sectors in India such as Kaur et al. (2009) and Singiriya and Naval (2016). Kaur et al. (2009) and Singiriya and Naval (2016) adopted input output model and co-integration techniques in their studies. However, they were unable to cover the main sectors of the country and also the time series data used for the studies were limited to a short period of time. Compared to the previous studies, therefore, the current study investigated all the main economic

sectors of India, and a quite long time period of fifty-seven years to secure the accuracy and reliability of the findings of this type of an empirical study.

On one hand, by using the extended and updated data, this paper shows that the agriculture sector had provided a positive impact on the service sector growth with a comparatively large magnitude in the Indian economic growth and development. The export growth also had made a positive link to the agriculture sector growth. On the other hand, India's industry sector and dominant service sector in GDP did not make any spillover on the other sectors to stimulate its economic growth and development except their direct impact through their own growths. Therefore, India's strongest sector in making links with other sectors is the agriculture sector and the second is the export sector of the country.

For the causal relationship study among the main economic sectors of India, this paper employs the Vector Auto Regression (VAR) model based on Johansen co-integration method along with the Granger Causality Test for the time-series data during the period from 1961 to 2017 by using STATA statistics and data analysis program.

This paper proceeds as follows. The second section introduces data, variables, and the model used in the current study. The third section provides the empirical results of the statistical analysis of the study. The implications are provided in the section four and the concluding remarks are included in the last section.

2. Methodology of the Study

In this section, sector linkages of the Indian economy for the time period of the year 1961 to year 2017 were estimated by using the VAR analysis based on the co-integration analysis. According to the estimates of the analysis, the nature and degree of sector linkages and their movements or changes during the time period are identified.

The objective of this paper is to provide an insight on the economic growth and development for the Indian economy especially identifying the inter-sectoral growth linkages in the development process during the last six decades. However, because of the implicit and complicated nature of the inter-sector linkages, the recent studies focused on this topic have employed several different statistical techniques to reveal such links at different times in different countries (Chebby and Lachaal, 2006; Hye, 2009; Gaspar, Pina and Simoes, 2014, Rahman and Hossain, 2014; and Singiriya and Naval, 2016).

This study employed Vector Auto Regression (VAR) to identify causal relationships between sector value additions, especially among the main economic sectors; the agriculture sector, industry sector, service sector, and the external sector (value of export) in India. Sector value additions serve as the proxies for the sector growths of the agriculture sector, industry sector and the service sector while export value serves as the proxy for the growth of the external sector. It was planned to identify the sector growth linkages between the agriculture sector, industry sector, service sector, and the export sector of India and degree of influence made by the growth of one sector on the growth of another sector of the country.

The four VAR equations are as follows:

$$AG_t= \alpha_a+ \beta_{aa}AG_{t-1}+ \beta_{ai} \, ID_{t-1}+\beta_{as} \, SE_{t-1}+\beta_{ae} \, EX_{t-1}+ \epsilon_a \dotfill (1)$$

$$ID_t= \alpha_i+ \beta_{ia}AG_{t-1}+ \beta_{ii} \, ID_{t-1}+\beta_{is} \, SE_{t-1}+\beta_{ie} \, EX_{t-1}+ \epsilon_i \dotfill (2)$$

$$SE_t= \alpha_s+ \beta_{sa}AG_{t-1}+ \beta_{si} \, ID_{t-1}+\beta_{ss} \, SE_{t-1}+\beta_{se} \, EX_{t-1}+ \epsilon_s \dotfill (3)$$

$$EX_t= \alpha_e+ \beta_{ea}AG_{t-1}+ \beta_{ei} \, ID_{t-1}+\beta_{es} \, SE_{t-1}+\beta_{ee} \, EX_{t-1}+ \epsilon_e \dotfill (4)$$

Where AG = log of agriculture sector value added

   ID = log of industry sector value added

   SE = log of service sector value added, and

   EX = log of export values of goods and services

The four VAR equations for each of the sectors; (1), (2), (3), and (4) were considered respectively for the agriculture sector, industry sector, service sector and the export of India. AG_t, ID_t, SE_t, and EX_t are the current value-added of agriculture, industry, service, and value of export respectively. They were constructed to have values compared to 2010 US dollars. In addition, export value is included to represent the external sector value-added such as changes in institutional and legal systems and all other factors. There is a pool of literature available hypothesizing numerous possible interactions between the agriculture sector, industry sector, and services sector while few of the literature have additionally included external sector (Value of export) (Subramaniam 2010). Besides, there are numerous evidences that countries had achieved a remarkable economic growth and development through export growth, experiencing some positive spillovers on the rest of sectors of their economies. (Darrat 1986; Marin, 1992; Judith et al., 2000 etc.). The β's denotes the coefficients attached to each of the lags of the endogenous variables and α's denotes constant terms. The t stands for the current year while t-1 stands for the lagged year. As examples, $\beta_{aa}AG_{t-1}$ represents the marginal impact of the previous year agriculture value-added on the current year value-added of the agriculture and $\beta_{ai} \, ID_{t-1}$ represents the marginal impact of the previous year industry value-added on the current year value-added of the agriculture and so on.

The study covered almost fifty-seven years with the use of time-series data of the time period from 1961 to 2017 for the empirical analysis. During these periods, India went through remarkable political, economic, social, and cultural changes brought by open economy policy regime of the country. The main data set was the World Development Indicators from the World Bank (2019).

The definitions for AG, ID, SE, and EX were from World Bank (2019). World Bank data on each sector was based on International Standard Industrial Classification (ISIC). Agriculture sector corresponded to ISIC divisions 1-5; Industry sector, ISIC divisions 10-45; Service sector, ISIC divisions 50-99, respectively. The concept of value addition was also from ISIC, revision 3 and 4. Hence, agriculture sector includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production. Industry sector includes manufacturing sectors. It comprises of value addition in mining, manufacturing, construction, electricity, water, and gas. Service sector includes value added in wholesale and retail trade, transport, and government, financial, professional, and

personal services such as education, health care, and real estate services. This sector also includes imputed bank service charges, import duties, and any statistical discrepancies noted by national compilers as well as discrepancies arising from rescaling. Exports of goods and services represent the value of all goods and other market services provided to the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude compensation to employees and investment income and transfer payments.

The VAR analysis in this paper is based on the co-integration analysis done by Johansen (1988& 1991), Johansen and Juselius (1990), and Stock and Watson (2001).The steps of the processes to conduct VAR analysis are; Selecting the lag length, Testing stationarity and degree of integration, Testing the Granger causality, and Estimating VAR respectively.

3. Empirical Results

This section presents the estimations of the VAR analysis. As the first step of the estimation process, the lag selection was carried out to use in the ADF test and VAR analysis of India for the time period from 1961 to 2017. Based on the different criterion in STATA program including Akaike Information Criteria (AIC), Hannan and Quinn Information Criterion (HQIC), Final Prediction Error (FPE), Likelihood Ratio (LR), and Schwartz Bayesian Information Criteria (SBIC), the optimum number of lags was determined. The optimal number of lag was selected based on a model with the lowest majority criterion to fit the model well. Lag-order selection statistics of VAR diagnostics test was conducted for the data sets to determine the optimal number of lags for the time slot. The Lag selection criterion proposes lag 1 for these time series tests as in the Appendix 1.

As the second step of the estimation process, Augmented Dickey Fuller (ADF) test was used to identify whether the time series has a unit root or not (Dickey and Fuller, 1979). This paper uses three different regression models in order to test the unit root of each time-series data;

$$\Delta Y_t = \Delta Y_{t-1} + \varepsilon_t \quad\quad\quad (5)$$
$$\Delta Y_t = \alpha + \Delta Y_{t-1} + \varepsilon_t \quad\quad\quad (6)$$
$$\Delta Y_t = \alpha + \Delta Y_{t-1} + \beta T + \varepsilon_t \quad\quad\quad (7)$$

Where Y is the time series variable, t the current year, $_{t-1}$ the previous year,α is the intercept, Δ the coefficient of the lag Y, T the trend, β the coefficient of the trend, and ε_t the error term, respectively. The data series is non-stationary if it fails to reject the null hypothesis indicating that the data series has a unit root.

Table 1: Augmented Dickey-Fuller test results, 1961-2017

Variable	Model	Level	1st Difference
LogAG	1st	5.155 ***	4.900 ***
	2nd	0.481	8.588***
	3rd	3.971**	8.645***
LogID	1st	4.868 ***	1.765**
	2nd	1.634	4.794 ***
	3rd	1.222	5.635***
LogSE	1st	6.592***	1.002
	2nd	3.895***	3.796***
	3rd	1.467	5.816***
LogEX	1st	4.852***	2.591**
	2nd	0.878	4.654***
	3rd	1.995	4.819***

Note: ** and *** denote the test statistics are significant at 5% and 1%, respectively
Source: Estimations of the current researcher

As in the Table 1, in the first model, all the time series data were stationary whereas in the second model and in the third models, the data series were non-stationary at their levels. When considering the first difference of data, all the time series became stationary in the 2nd model and in the 3rd model. Accordingly, in the 2nd and in the 3rd model, the time series were integrated at order one. Therefore, VAR estimation could be applied for the time series data of the considered time period of the country.

In order to identify the direction of the causal relationship between the value added of the agriculture sector, industry sector, service sector, and the value of export of the Indian economy, the Granger Causality Test (GCT) was used.

Table 2: Granger Causality test results, 1961-2017

	F- Statistics	Probability
ID to AG	0.87056	0.351
SE to AG	1.8063	0.179
EX to AG	6.459**	0.011
AG to ID	0.71324	0.398
SE to ID	2.4243	0.119
EX to ID	1.4039	0.236
AG to SE	27.856**	0.000
ID to SE	1.6568	0.198
EX to SE	2.9345*	0.087
AG to EX	0.39276	0.531
ID to EX	0. 33891	0.560
SE to EX	1.2353	0.266

Note: ** denotes significant at 5% and * denotes significant at 10%
Source: Estimations of the current researcher

Table 2 exhibits Granger causalities between the values added of the main sectors of the Indian economy and shows that there were three significant Granger causalities between the main sectors of the economy. Accordingly, the relationships from the export sector to the agriculture sector, from the agriculture sector to the services sector, and from the export sector to the services sector were only unidirectional. Therefore, the results did not show bidirectional relationships among the main sectors of the country.

Table 3 indicates that there are three significant links between the sectors of the Indian economy for the time period from 1961 to 2017. First, it could be recognized that the previous year agriculture sector value-added made links to the current year agriculture sector value-added in a negative way, but it made links to the current year service sector value-added in a positive way. Secondly, the previous year service sector value-added had a positive link to its own current year value added. Finally, the previous year export value made positive links to the current year agriculture sector value added and it made a negative link to the current year services sector value added.

When the previous year export value change by one unit, it affected to increase current year agriculture value added by 0.18 units though it affected to reduce current year service value added by 0.06 units. On the other hand, a unit change in the previous year agriculture value-added affected to decrease its own sector but to increase the service sector value added by 0.35 units. Therefore, during the time period of year 1961 to year 2017, there were only two positive links between the sectors of India: from the agriculture sector to the service sector and from the export sector to the agriculture sector. In addition, the agriculture sector influenced the other sectors in the most significant and positive way in the India economy.

Table 3: VAR Estimation results for the period, 1961-2017

	ΔlogAG	ΔlogID	ΔlogSE	ΔlogEX
ΔlogAG (-1)	-0.5634297**	0.0686723	0.346761**	0.166399
	(0.1452363)	(0.0813136)	0.065701	(0.2655122
	[0.000]	[0.398]	[0.000]	[0.531]
ΔlogID (-1)	0.2353523	0.1956944	0.1468767	0.2684538
	(0.2522423)	(0.1412232)	(0.1141076)	0.4611342
	[0.351]	[0.166]	[0.198]	[0.560]
ΔlogSE (-1)	-0.3747928	0.2430909	0.4591367**	0.5666052
	(0.2788629)	(0.1561272	(0.1261501)	(0.5098003)
	[0.179]	[0.119]	[0.000]	[0.266]
ΔlogEX (-1)	0.1847538**	0.0482242	-0.0563343*	0.0075684
	(0.0726963)	(0.0407005)	(0.0328858)	(0.132899)
	[0.011]	[0.236]	[0.087]	[0.955]
Constant	0.0421722*	0.0217357*	0.0261281**	0.020102
	(0.0218884)	(0.0122547)	(0.0099017)	(0.0400151)
	[0.054]	[0.076]	[0.008]	[0.615]
R^2	0.2932	0.1585	0.4587	0.0466[2]

Note: ** denotes significant at 5% and * denotes significant at 10%. Standard errors are in ( ), p values in [ ]
Source: Estimations of the current researcher

4. Implications of the Study

During the time periods, two positive links and one negative link were discovered based on the VAR estimations between the main sectors of the Indian economy. The growth of the agriculture sector made a positive link to the service sector growth without having any link to the other sectors contradictory to the findings of the early studies. Some of the early writers (Lewis, 1954; Ranis and Fei, 1961; Jorgenson, 1961 etc.) identified the role of the agriculture sector as an engine of accelerating the industrial growth. However, Kuznets (1971) came up with a with a different idea based on his observation that the technological advancement must be supportive for industrialization as well the enhancement of the agriculture productivity in a framework of successful development strategy while pointing out the basic stylized facts of industrialization as the shift away from agriculture and the shift away from agriculture employment. The revolutionary ideas of Kuznets; the enhancement of agriculture productivity and the integration of the transformed agriculture sector into the industrialized economy are inseparable bases of modern economic growth. Evidencing the importance of the role of the agriculture sector in economic growth, latest studies in Malaysia, Pakistan and Bangladesh found association between agriculture and the GDP growth of the countries and their policy recommendation was to promote policies and programs which enhance

---

[2]The low R^2 values are not unusual in the empirical studies on the structural changes and economic development. Refer to Gasper, Pina and Simoes (2014) and Singiriya and Naval (2016).

agricultural output (Matahir and Tuyon, 2013; Anwar, 2015; Rahman and Hossain, 2014).

During the post-liberalization period of India, as the country's service sector grew remarkably, the country became a major center of information technology services, business outsourcing services, and software work compared to its industry sector. Therefore, it is a clear indicator that the Indian economy had jumped or had been directed to the service sector developments without giving much priority to the expansions and developments in the industrial sector which had been identified as one of the bases of modern economic growth (Kuznets, 1971). Also, mechanization of the agriculture sector and industrial sector is rather possible and easy than mechanization of the service sector since services are labor-intensive and requires more sophisticated and highly expensive modern technology (Subramaniam, 2010) and advanced knowledge under the latest developments. Within this context, most of the countries had taken off the agriculture and industries before they take-off in the service sector. The required high-cost modern technology had impacted to absorb more labor into the service sector of most of the developing countries than to the industrial sector since the technology improvements and very limited human capital advancement among them. But the developing countries like India within which modern information and high-tech services are developed and outsourcing of their services is practiced, it had led to grow their service sector very fast (Singiriya and Naval, 2016).

The export growth had made a positive link to the agriculture sector growth with a comparatively large magnitude during these time periods, implying a positive spillover from export growth to agriculture sector growth. When considering the export growth during the time period of 1961 to 1990, however, it exhibits that there were a lot of ups and downs even with negative values in export growth (see the Appendix 3). The country's export growth scenario had changed starting from early 1990s because the growth of export had become very fast and remarkable and there were no negative growths until middle of 2020's. Therefore, it is evident that, since 1990, the fast-growing export sector had made a significant influence on the agriculture sector of the country. It is also worth noting that India's export had grown fast after trade liberalization policy due to the expansion of its IT sector such as information technology services, business outsourcing services, and software work. (Singiriya and Naval, 2016; Index of Economic Freedom, 2019).

Another noteworthy result was that the India's industry sector did not make any spillover on the other sectors of the country but also it was not benefited from the growth of the other sectors. Therefore, most curtail and inseparable bases of modern economic growth; the enhancement of agriculture productivity and the integration of the transformed agriculture sector into the industrialization (Kuznets, 1971) of India had not happened appropriately in its growth momentum.

Regardless of its developed ICT and software-based services, the service sector also did not make any association with the other sectors to increase the growth of those sectors. There were, however, remarkable growths in the industry sector and the service sector of the country during the past several decades and they were moving very fast with compared to the agriculture sector of the country (see

the Appendix). Therefore, it is evident that the fast-moving industry sector and service sector of India had not made positive spillover on the other sectors to stimulate its economic growth and development except their direct impact through their own growths.

In addition, agriculture sector and export sector make both direct and indirect impacts on the economic development of the country through their positive spillover on the service sector and agriculture sector growths respectively. Therefore, it is very clear that the India's strongest sector in making links with other sectors is the agriculture sector of the country even though economic growth and development of India did not follow the traditional sequential order of agriculture to industry to services as described by the Rostow (1956), Ranis and Fei, (1961) and Lewis (1954) or any other economists but the developing countries could go through a unique path which is success or not. Despite the negative spillover of the export growth on the growth of the service sector, the export is the second in making sector linkages.

5. Concluding Remarks

Lack of awareness and a relatively shorter period of examination of the sector linkages by the previous studies motivated this paper to explore inter sectoral linkages of India for its economic development. Though the economic growth of India is robust after trade liberalization policy, it has not still reached the developed country level. Therefore, India needs to maintain and increase the economic growth in order to move to the next level in its economic growth and development.

There are complicated and multidirectional inter sectoral linkages between main economic sectors; agriculture sector, industry sector, services sector, and external sector. Those linkages are very important for future economic growth and development. Nonetheless, the sector linkages of India have not been properly developed by keeping the linkages heterogeneous. The necessary linkage level of industry sector has not occurred in India where industry sector does not play a significant role by making positive spillover to the other sectors of the country as well as the industry sector also was not benefited from the growth of the other sectors of the country. It is very clear that the agriculture sector and service sector itself played a significant role in the service sector development of the Indian economy. Further, the dominant service sector, however, does not play a proper role by making positive spillover towards the other sectors either.

The agriculture sector is the most influencing sector in India, and it makes positive links to the growth of the service sector of the country and it is followed by the export making a positive impact on the growth of the agriculture sector. Hence, it is still important to recognize agriculture sector as a source of contribution that helps economic growth and development of this emerging economy of India. The government needs to pay more attention to the agricultural sector and use new paradigm shift in their development agenda giving a priority to the sector to overcome existing development issues such as slow and imbalanced development, severe poverty incident, inequality, food insecurity and environmental issues etc., which are closely related to the agricultural sector particularly in the developing

countries like India. The necessary bidirectional positive linkages between industry sector and the agricultural sector are needed to be recognized by the policy makers of the country in order to increase the growth of both the sectors simultaneously at the current development level (as a developing country) of the country to create more job opportunities in the industry sector and to improve the productivity in the agriculture sector. Further the export led growth of the agriculture sector through the positive linkages of the export sector could play a significant role in the development movement of the country by fueling the agriculture sector to increase the productivity of the sector and thereby to increase the positive spillover from the agriculture sector towards the expansions and growth of the other sectors of the country.

References

Anderson, K., (2009). Distortions to Agricultural Incentives, *A Global Perspective*, *1955–2007,* World Bank.

Anwar M. Masood, 2015, Agriculture sector Performance: An analysis through the role of agriculture sector share in GDP, *Journal of Agricultural Economics, Extension and Rural Development*- ISSN-2360-798X, Vol.3(3), 270, 75.

Cervantes-Gdody., D. & J. Dewbre. (2010). Economic Importance of Agriculture for Poverty Reduction, *OECD Food, Agriculture and Fisheries Papers*. No.23, 1, 21. OECD Publishing

Cervantes-Godoy, D. & J. Brooks, (2008). Smallholder Adjustment in Middle-Income Countries: Issues and Policy Responses, *OECD Food, Agriculture and Fisheries Working Papers,* No. 12. OECD Publishing.

Chebbi, H. E. & L. Lachaal, (2006). What Role for the Agriculture in the Process of Economic Growth of Tunisia? Evidence from Multivariate Co-integration, *9ᵗʰ Annual Conference on Global Economic Analysis*, Addis Ababa, Ethiopia

Darrat, A. F. (1986) "Trade and development: the Asian experience," *Cato Journal*, No. 6, 695-699.

Dickey, D. A. & F. Wayne, (1979). Distribution of the Estimators for Autoregressive Time Series with a Unit-Root, *Journal of the American Statistical Association*, Vol. 74, 427-431.

Gasper, J., G. Pina % M. Simoes (2014). Agriculture in Portugal: linkages with industry and services, Vol. 95, 437-471.

Harrington, A. (2005). The Contribution of the Primary Sector to New Zealand Economic Growth, *New Zealand Treasury Policy Perspectives Paper.*

Hye, Q. M. A. (2009). Agriculture on the Road to Industrialization and Sustainable Economic growth: An Empirical Investigation for Pakistan, *International Journal of Agricultural Economics & Rural Development,* Vol. 2, No. 2, 1-6.

Index of Economic Freedom (2019), 226, 27. https://www.heritage.org/index/

Johansen, S. (1988). Statistical Analysis of Co-integration Vectors, *Journal of Economics Dynamics and Control,* Vol. 12, 232-254 .

Johansen, S. (1991). Estimation and Hypothesis Testing of Co-integration Vectors in Gaussian Vector Autoregressive Models, *Econometrica*, Vol. 59, 1551-1580.

Johansen, S. & J. Katarina, (1990). Maximum likelihood Estimation and Inference on Co-integration- With applications to the Demand for Money, *Oxford Bulletin of Economics and Statistics*, Vol. 52, 169-210.

Jorgenson, 1961, The Development of Duel Economy, *Economic Journal*, 282 (accessed November 25, 2018).

Judith, D., K. C. Fung, & Z. Wang, (2008). How vertically specialized Chinese TradeInstitute for Economies in Transition, *Bank of Finland*, BOFIT.

Kaur, G., S. Bordoloi, & R. Rajesh, (2009). An empirical investigation on the inter-sectoral linkages in India, MPRA paper.

Kim, H. & Y. Lee, (2003), Agricultural Policy Reform and Structural Adjustment: Historical Evidence from Korean Experience, *Workshop on Agricultural Policy Reform and Adjustment,* Imperial College, Wye, October, 23-25.

Kuznets, S. 1971, Economic Growth of Nations: Total Output and Production Structure, Cambridge, MA: Harvard University Press. http://documents.worldbank.org/curated/en/147291468331145843/pdf/119110 PUB0English0Box353765B01PUBLIC1.pdf (accessed July 03, 2018).

Lewis Aurthur W. (1954) https://la.utexas.edu/users/hcleaver/368/368lewistable.pdf (accessed January 24, 2016)

Marin, D. (1992). Is the export-led growth hypothesis valid for industrialized countries? *Review of Economics and Statistics,* Vol.74, 678-688.

Matahir H. & Tuyon, (2013). The Dynamic Synergies between Agricultural Output and Economic Growth in Malaysia, *International Journal of Economics and Finance.* Vol. 5. No. 4. ISSN 1916-971X E-ISSN 1916-9728, Published by Canadian Center of Science and Education. 61, 70.

OECD (1999). Review of Agricultural Policies in Korea. National Policies and Agriculture Trade, *OECD Publications Service.*

Rahman Z. & Hossain E. Md. (2014). Role of Agriculture in Economic Growth of Bangladesh: A VAR Approach, Journal of Business Studies JBS_ISSN 2303-9884 Volume-7. 163, 65.

Rehman, A., L.Jingdong, B. Shahzad, A. AliChandio, I. Hussain, G. Nabi, & M. Shahidlqbal, (2015). Economic Perspectives of major field crops of Pakistan; An empirical study, Pacific Science Review B: Humanities and Social Sciences,Vol. 1, 145-158.

Ramsey, F. (1928). A Mathematical Theory of Savings. *The Economic Journal*. Vol. 38, 543-559.

Ranis G. & Fei J. C. H. (1961). A Theory of Economic Development. *The American Economic Review,* Vol. 51, No. 4 (Sep., 1961), 533-565

Rostow W. W.1956, The Take-Off into Self-Sustaining Growth, Econ. Jour., March 1956, 66, 25, 48

Singariya, M. R. & S. C. Naval (2016). An Empirical Study of Inter-Sectoral Linkages and Economic Growth in India, *American Journal of Rural Development*, Vol. 4, No. 4, 78-84.

Stock, H. J. & M. Watson (2001). Vector Auto-regressions, *Journal of Economics Perspectives,* Vol.15, No.4, 101-115.

Stock, H. J. & M. Watson (2012). *Introduction to Econometrics*. Essex CM20 2JE, England. Pearson Education Limited.

Subramaniam, V. (2010). *Agricultural Inter-sectoral Linkages and Their Contribution to Economic Development,* University of Kentucky Doctoral Dissertations, Paper 771.

Timmer, P. C. (1988). The Agricultural Transformation. *Handbook of Development Economics*, Vol. 1, 270-328, North Holland.

Timmer, P. C. (2002). Agriculture and Economic Development. *The Handbook of Agricultural Economics,* Vol. 2, 1487-1546, North Holland.

Timmer, P. C. (2009). A World without Agriculture: The Structural Transformation in Historical Perspective. *Henry Wendt Lecture*, American Enterprise Institute.

Timmer, P. C. (2012). Structural Transformation, the Changing Role of Rice, and Food Security in Asia: Small Farmers and Modern Supply Chains, *Asian Journal of Agriculture and Development,* Vol. 9, No. 1, 21-32.

Appendix 1: Lag selection, 1961-2017

```
. varsoc logAG logID logSE logEX
```

```
    Selection-order criteria
    Sample:  1965 - 2017                        Number of obs      =        53
```

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	133.113				9.0e-08	-4.87219	-4.81501	-4.72349
1	410.558	554.89	16	0.000	4.7e-12	-14.7381	-14.4521*	-13.9945*
2	427.764	34.411*	16	0.005	4.5e-12*	-14.7835*	-14.2689	-13.4452
3	434.213	12.897	16	0.680	6.7e-12	-14.4231	-13.6797	-12.49
4	445.386	22.347	16	0.132	8.4e-12	-14.241	-13.2689	-11.7131

```
    Endogenous:  logAG logID logSE logEX
     Exogenous:  _cons
```

```
. varsoc logAG logID logSE logEX
```

```
    Selection-order criteria
    Sample:  1965 - 2017                        Number of obs      =        53
```

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	133.113				9.0e-08	-4.87219	-4.81501	-4.72349
1	410.558	554.89	16	0.000	4.7e-12	-14.7381	-14.4521*	-13.9945*
2	427.764	34.411*	16	0.005	4.5e-12*	-14.7835*	-14.2689	-13.4452
3	434.213	12.897	16	0.680	6.7e-12	-14.4231	-13.6797	-12.49
4	445.386	22.347	16	0.132	8.4e-12	-14.241	-13.2689	-11.7131

```
    Endogenous:  logAG logID logSE logEX
     Exogenous:  _cons
```

Appendix 2: Average annual GDP growth rates of SAARC, 1961-2017

Country	Average GDP growth						Average GDP Per Capita Growth					
Year	1961-1970	1971-1980	1981-1990	1991-2000	2001-2010	2011-2017	1961-1970	1971-1980	1981-1990	1991-2000	2001-2010	2011-2017
Afghanistan	-	-	-	-	9.13	4.77	-	-	-	-	5.53	1.67
Bangladesh	4.06	1.04	4.02	4.68	5.58	6.57	0.99	-1.22	1.30	2.46	4.06	5.38
Bhutan	-	-	10.10	4.99	8.75	6.03	-	-	7.13	4.31	6.20	4.47
India	4.03	3.08	5.57	5.60	7.54	6.82	1.89	0.74	3.25	3.60	5.87	3.88
Maldives	-	-	-	4.6	2.60	3.44	-	-	-	6.75	5.34	6.13
Nepal	2.52	2.11	4.79	5.00	3.93	4.22	0.74	-0.07	2.41	2.55	2.59	3.02
Pakistan	7.24	4.72	6.29	3.96	4.22	4.47	4.52	1.67	2.92	1.37	2.08	2.34
Sri Lanka	4.62	4.42	4.20	5.22	5.20	5.50	2.19	2.57	2.73	4.38	4.49	4.61

Source: World Bank, World Development Indicators, 2017

Appendix 3: Annual growth rates of the sectors of India, 1961-2017

Year/ Sector	Annual % growth			
	Agriculture	Industry	Services	Export
1961	0.084207	6.786717	9.608675	-0.18587
1965	-11.0422	4.09364	8.815679	-13.8642
1970	7.092165	0.744804	5.623392	31.55782
1975	12.88978	7.08466	2.841055	16.44884
1980	12.88823	5.242569	-0.15223	5.23733
1985	0.314273	4.382917	10.40022	-6.31491
1990	4.015096	7.331094	4.791814	11.10442
1995	-0.69538	11.28978	12.19654	31.39607
2000	-0.00762	6.032131	5.833271	18.15351
2005	5.139665	9.716998	11.75748	26.07376
2010	8.597295	7.551001	9.946889	19.61633
2015	0.591683	9.794585	9.553153	-5.59311
2017	3.368423	5.543367	7.920874	5.578147
Agriculture	Agriculture, forestry, and fishing, value added			
Industry	Industry (including construction), value added			
Services	Services, value added			
Exports	Exports of goods and services			

Source: World Bank, World Development Indicators, 2017