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Relationship between Sectors Shares and Economic Growth in Pakistan: A Time Series Modeling Approach

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Abstract

The objective of this study is to examine a relationship among agriculture, manufacturing, services sectors, and Gross Domestic Product (GDP) growth in Pakistan. In order to explore this relationship, Time Series data has been taken for the period of 1989 to 2012. This study employed the Econometrics technique to investigte a relationship between sector shares and economic growth. In order to select the best technique, Vector Error Correction Model (VECM) is applied. Wald Test is used to check the short run Causality among variables (i.e., agriculture, manufacturing, services, and GDP). VECM confirmed that there is a long run Causality from agriculture, manufacturing, and services sectors to GDP in Pakistan. There is a short run Causality from manufacturing and services sectors to GDP and same applies for GDP to agriculture and manufacturing sectors. But there is uni-directional Causality from manufacturing sector to GDP and from services sector to agriculture sector. Findings of the study exhibit that GDP will be positively influenced due to increase in agricultural and manufacturing, whereas services sector does not influence GDP but GDP influences services sector in Pakistan.

Keywords

Sector shares, Economic growth, Co-integration, VECM

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1. Introduction

Sector share is one of the major forms of economic growth, which leads to economic development. Every sector has its own impact on economic growth. Empirical studies investigated the relationship between sector shares and economic growth. This study includes extended variables and investigates the relationship among agricultural, manufacturing, services sector and economic growth. This study is conducted in order to analyze both long term and short term relationship (Rahman et al., 2011). Relationship among these variables is important for two main reasons. Firstly, sector shares have always played a significant role in economic growth. Sector share stimulate immense economic growth by expanding business activities, increasing employment opportunities and encourages Foreign Direct Investment (FDI) in the country and etc. Secondly, it is important for government what policies should it adopted regarding sector shares in order to sustain economic growth (Tang, 2002).

For designing economic development policies the evaluation of sectoral economic performance and sectoral growth linkages are both very important issues. Sectoral interaction is one of the most important sources of economic expansion in a competitive economy. A sector with high backward and forward linkages should be the focus of the development effort and there is a strong case for concentrating investment in this sector. The expansion of this sector has significant impact on increasing output, per capita income and employment levels throughout the economy. The agriculture sector is the main sector of the economy. This sector provides the food, labor, capital, foreign exchange and other inputs, which must play a crucial role in establishing the framework for industrialization. The relative share of agriculture in GDP declines sharply while the industry share increases significantly and provides the leading role in the economic growth of the economy. Rising industrial wages, on one side, can faster growing agriculture product demand. On the other side, higher wages is the root cause of down falling in the labor's share in the agriculture sector (Jatuporn et al., 2011).

The agricultural sector is vital and has proven its significance globally. The association between the agricultural sector and economic boost has been greatly studied in the growing literature. There are many causes such as increase in the rate of rural population, a large contribution of employment in the agricultural sector, sector share to the formation of national income, and production capacity of sector. The agricultural sector is the backbone of the rural economy (Srikanth and Sathyanarayana, 2011).

The relationship between economic growth and services producing sector is not more complicated. This sector is extremely seen as a way to speed up economic development and alleviate poor quality. It is gradually enhancing the greatest sector, in terms of contribution of GDP and employment acceleration in most developing countries. Services sector calculation of positively to GDP per capita and wholesale retail trade has a deep effect on the economy followed by the transport and communication sector and the financial sector (Tandrayen-Ragoobur, 2010).

Manufacturing sector has a deep association with economic development the relationship between industrial progress and GDP improvement can be described by the impact of producing on productivity levels in the economy; These influences and impacts are due to transmission of labor from low productivity sectors to the industrial sector and to the existence of static and dynamic economies of scale in manufacturing (Wang, 2009).

1.2 Research Objectives: The purpose of this research is to study the relationship among agriculture, manufacturing, services sector and economic growth in Pakistan. Specific objectives of this research are:

- To determine the long run relationship among sector shares and economic growth.
- To find the short run relationship among sector shares and economic growth.
- To find the possible existence of Causality running from economic growth to agricultural, manufacturing and services sectors and vice versa.

2. Literature Review

Awokuse and Xie (2015) analyzed the Causal link between economy growth and agriculture sector by taking the Time Series data of nine developing countries from Asia, Sub-Saharan African, and Latin America. They results of empirical analysis showed mixed results such as some countries supports the agriculture led growth hypothesis, some countries supports in growth led hypothesis whereas some countries in supports of Bivariate relationship. Results showed that their study should not generalize for all developing countries.

Lee and McKibbin (2014) checked the influence of services sector productivity on Asian economic growth. They applied General Equilibrium Model and concluded that rapid growth of service sector of Asia have major contribution in

other sectors of Asia which finally represent the economic growth of Asia. Mujahid and Alam (2014) empirically investigated performance and relationship between services sector and economic growth in Pakistan. They furthermore, examined the determinants of services sector growth (i.e., labor force, external debt, government expenditures, population, Foreign Direct Investment FDI), and GDP. Study checked the short run and long run relationship among the concerned variables by using VECM and Co-integration method, and concluded that FDI, population and consumption have significant influence on growth of services sector in Pakistan. Singh (2014) stated that economy growth could be improved via tertiary/service sector growth as compare to primary sector growth.

Farooq et al. (2013) investigated the impact of key factors like agriculture, industrial, services sectors output, currency exchange rate and the trade hugeness on the economic growth of Pakistan. VAR based Co-integration approach was applied on Time Series data. They found that real GDP significantly and positively affected by the coefficients of services, agriculture, trade openness, industrial output and exchange rate. Guncavdi et al. (2013) studied the performance of agriculture sector in economic development and structural change in turkey by taking Time Series data. They revealed that agriculture sector played very important role in the economic growth and other sectors depends heavily on it.

Behera (2012) analyzed the sectoral shares in state domestic product and inter sectoral linkages in Indonesia by implying Error Correction Model on Time Series data. Results of study found a weak linkage among the primary and secondary sectors. At one side, a strong relationship was found among secondary and TSC services but on the other hand there is independent long run relationship within FIRB. There is a weak relationship among the sectors in the short run. Although the linkage among the sectors is significant, but it is not linked with three sector analysis where primary sector is completely missing for a relatively faster adjustment towards long run equilibrium rate of growth. Gilaninia et al. (2012) examined the economic growth in Iran and its factors which effect the growth. Authors employed Auto Regressive Conditional Heteroscedasticity model. Results revealed the existence of a positive impact of FDI and foreign investment in portfolio on the economic growth of those countries which have higher degree of globalization. Finally, the fluctuation in the commercial cycle decreased the economic growth in long term. Matahir (2012) studied the linkage between industrial sector and the agriculture sector. Matahir (2012) found that industrial sector and agricultural sector are co integrated in the long run. There is

uni-directional Causality between concerned variables in long run as well as in short run and Causality run from industrial sector to agriculture sector. This study concluded that output of agriculture sector may improve by the industrial sector. Alataweneh (2012) examined the relationship between manufacturing, services, and agriculture sectors by using vector error correction model. According to the results, the restructuring of banking and improvement in the service quality is very beneficial for the agricultural sector. Agriculture sector is also getting benefits from the development of commerce and service sector. The credit market constraints could not slow down the growth of agriculture sector in Palestine.

Rahman et al. (2011) examined the Causal relationship between GDP, agricultural, industrial and service sectors output in Bangladesh. They used Granger Causality and Wald Tests by taking Time Series data. Results shows that agricultural and industrial sector are the influencing factor of the GDP of Bangladesh and vice versa, whereas service sector does not influence the GDP but GDP influences the service sector to grow up. Jatuporn et al. (2011) examined the relationship among agriculture sector and economic growth in Thailand. Granger Causality Test and the Wald coefficient statistic were employed on Time Series data. They found a long run relationship and size impact from agriculture sector towards economic growth and also from economic growth towards agriculture sector. Szirmai (2011) studied appearance of manufacturing sector in developing countries by taking panel data on structural changes from 67 developing countries and 21 advanced countries. According to the results, industrialization is the engine of growth for the developing countries and attempt to measure different aspects of debate. Though the Manufacturing sector has become important for the growth of the developing countries but it is not only the engine of growth.

Ali et al. (2010) investigate the dynamic interaction among macroeconomic indicator and agricultural income in Malaysia. Authors found that macroeconomic policy changes have affected Malaysian agriculture economy greatly in recent years through its impacts on money supply, exchange rates, interest rate and inflation. However, money supply and rates of interest play a crucial role to influence agricultural performance in the country. Chakraborty and Nunnenkamp (2008) made an attempt of sector level analysis between India's economic reformation, economic improvement and FDI. Granger Causality Test was used to examine the Causal relationship by considering industry FDI and outcome. Authors also applied Panel Co-integration framework which shows long lasting and near future dynamics between the FDI and growth.

3. Theoretical Framework

The theoretical framework is considered to assist the reader in developing rational sense of the relationships of the variables and factors that have been related to the problem. It offers relationships between all the variables so the reader can comprehend the theoretical link between them. A theoretical framework provides guidance in research study, evaluates what things researcher is about to measure, and what statistical link has to look for.

3.1 Economic Base Theory: Economic Base Theory suppose that all local level economic relevant activities can be labelled as basic or non basic. According to Economic Base Theory as prescribed by Weimer and Hoyt (1948), this theory is the duality of regional economic activity, its fundamental behavioral assumption is that non-basic economic activity depends on basic economic activity. For example, "if a sector accounts for 6 percent of regional growth but only 2 percent of national growth, two thirds of that sector's grwoth would be called basic. (If the regional activity in a sector is less than that at the national level, the sector is categorized as non-basic.)". Firms that sell stuff to both local and an export market essentially, be allocated to one of these areas or some means of assigning their employment to each sector must be employed. Ways of allocating firms to basic and non basic sectors is debated in the different techniques outlined below (Blumenfeld, 1955).

3.2 The Importance of the Economic Base: Why the difference between basic and non basic is important? Economic Base Theory professes that the ways of strengthening and improving the local economy is to establish and expand the basic sector. The basic sector is therefore determinedas the "engine" or "wheel" of the local economy. "The Economic Base technique is on a rely on simple Causal model that asserts the basic sector is the basic reason of local economic growth, that it is the Economic Base of the local economy", Klosterman (2009). Economic Base Theory also points that the local economy is at its best when it promotes those economic sectors that are not linked to the local economy. By establishing firms that depend mainly on external markets, the local economy offers a protective shell from the economic downfall since, it is believed, that these external markets will still be powerful even if the local economy suffers from serious issues. In opposite to that, a local economy completely that rely upon local factors will have immense problem responding to stagnant economy.

4. Data and Econometric Methodology

Secondary data is used to examine the relationship between agriculture, manufacturing, services sectors and GDP. Time Series data of all the variables is obtained from secondary sources (i.e., State Bank of Pakistan, Economic Survey of Pakistan, International Monetary Fund, and World Bank over a period of 1989-2012.

4.1 Econometric Methodology: This section is the complete procedure and methodology that is used to attain the research objectives. After data collection, the variables are modeled in an appropriate econometric framework. E-views version 6.0 is used for the analysis of econometrics results. Firstly, stationarity is check by using Unit Root Test. There are different techniques to check the stationarity but under this study ADF Unit Root Test is used. Secondly, a VECM model is used to determine the long run relationship among sector shares and economic growth.

$$\Delta Ln\ GDP_t = u_1 + \sum_{i=1}^{0} €_i\, \Delta Ln\ GDP_t\ + \sum_{i=1}^{p} £_i\, \Delta Ln\ \text{Agricultural}_{,t} + \sum_{i=1}^{q} ¥_i\, \Delta Ln\ \text{Manufacturing}_t\ + \sum_{i=1}^{r} \Omega_i\, \Delta Ln\ \text{Services}_t\ + \omega \text{ECT}_{t-1} + e_t \quad (4.1.1)$$

$$\Delta Ln\ \text{Agricultural}_t = u_1 + \sum_{i=1}^{o} £_i\, \Delta Ln\ \text{Agricultural}_t + \sum_{i=1}^{p} €_i\, \Delta Ln\ GDP_t\ + \sum_{i=1}^{q} ¥_i\, \Delta Ln\ \text{Manufacturing}_t\ + \sum_{i=1}^{r} \Omega_i\, \Delta Ln\ \text{Services}_t\ + \omega \text{ECT}_{t-1} + e_t \quad (4.1.2)$$

$$\Delta Ln\ \text{Manufacturing}_t = u_1 + \sum_{i=1}^{o} ¥_i\, \Delta Ln\ \text{Manufacturing}_t + \sum_{i=1}^{p} €_i\, \Delta Ln\ GDP_t\ + \sum_{i=1}^{q} £_i\, \Delta Ln\ \text{Agricultural}_t\ + \sum_{i=1}^{r} \Omega_i\, \Delta Ln\ \text{Services}_t\ + \omega \text{ECT}_{t-1} + e_t \quad (4.1.3)$$

$$\Delta Ln\ \text{Services}_t = u_1 + \sum_{i=1}^{o} \Omega_i\, \Delta Ln\ \text{Services}_t + \sum_{i=1}^{p} €_i\, \Delta Ln\ GDP_t\ + \sum_{i=1}^{q} £_i\, \Delta Ln\ \text{Agricultural}_{,t} + \sum_{i=1}^{r} ¥_i\, \Delta Ln\ \text{Manufacturing}_t\ + \omega \text{ECT}_{t-1} + e_t \quad (4.1.4)$$

Wald Test is used to determine the short run relationship among sector shares and economic growth. Granger Causality Test is used to determine general Causality and long term and short term relation among agricultural, manufacturing, services sector and economic growth.

Let *y* and *x* be two stationary Time Series variables. To test the null hypothesis that *x* series does not Granger-cause by *y* series, firstly reveals the proper lagged values of *y* variable to comprise in Univariate-Autoregression of *y* series

$$y_t = a_0 + a_1 y_{t-1} + a_2 y_{t-2} + \cdots + a_m y_{t-m} + e_t \quad (4.1.5)$$

Now, Auto-regression is augmented by including the lagged values of *x* series

$$y_t = a_0 + a_1 y_{t-1} + a_2 y_{t-2} + \cdots + a_m y_{t-m} + b_p x_{t-p} + \cdots + b_q x_{t-q} + e_t \quad (4.1.6)$$

5. Discussion and Findings

The results of the Unit Root Tests are summarized in Table 2 to 5 in Appendix. The null hypothesis which is that variable is not stationary cannot be rejected at level because *P-value* is more than 5%. But the null hypothesis is rejected at 5% significant level at first difference. Therefore, it is concluded that all the series are stationary and integrated of order one, i.e I(1) over the sample under consideration.

After stationarity of variables, next step is to determine whether the long run Equilibrium relationship exists among concerned variables or not. The Johansen Co-integration Test is deployed to determine the long run association. The estimated results of the Co-integration for the relevant variables are reported in Table 6 in Appendix. *P-values* of Johansen Trace statistics and Maximum Eigen Value statistics found long-run relationship among agriculture, manufacturing, services and GDP. The results of Johansen Co-integration Test shows that *P-value* (0.0057) of Trace statistics and Maximum Eigen Value is less than 5%, so null hypothesis can be rejected that there is no Co-integration among variables, and accept alternative hypothesis which is that Co-integration or long run relationship exist among variables.

Since all the variables are I(1) and having found that there is a Co-integration among variables, it implies that Granger Causality exists in at least one direction. But Co-integration does not identify the direction of Causality. Error Correction Model (ECM) is deployed to determine the direction of Causality. The significance of ECM not only determines the direction of Causality but also distinguished between short run and long run Causality. Long run Causality is examined through the significance of coefficient of the Lagged Error Correction term. Results of long term Causality are reported in Table 7 in Appendix. Since the *P-value* (0.0034) of Error Correction term is less than 5%, so the null hypothesis is rejected which states that there is no long run Causal relationship

from agriculture, manufacturing and services sectors to GDP. Alternative hypothesis is accepted, it implies that there is long term link from agriculture, manufacturing and services to GDP.

To determine the short run Causality under VECM model Wald Test is applied. Results of Wald Test of Pakistan are shown in Table 8. Coefficient of variables are c(4), c(5), c(6), c(7), c(8), and c(9). Whereas, c(4) and c(5) are representing to agriculture, c(6) and c(7) to manufacturing, c(8) and c(9) are representing to services. If these coefficients affect the GDP, then it can be said that there is short term Causality from independent variables agriculture, manufacturing and services to dependent variable GDP. Decision is taken on the basis of *P-value* of Chi-square. If *P-value* is less than 5%, than H_0 is rejected, which means that there is short term Causality between variables.

So, it is observed that corresponding *P-value* (0.0879) of Chi-square of agriculture variables is greater than 5%, so the null hypothesis is accepted, which shows that there is no short run Causality from agriculture to GDP, and *P-value* (0.0205), (0.0168) of two variables manufacturing and services is less than 5%, so the null hypothesis is rejected which shows that there is short run Causality from manufacturing and services to GDP.

Pairwise Granger Causality Test is used to determine the Causality between the series of variables. Results are shown in Table 9. Results of Granger Causality show that there is no direction Causality from agriculture and services to GDP and from manufacturing to agriculture and from services to manufacturing and vice versa. But there is unidirectional Causality from manufacturing to GDP and from services to agriculture.

6. Conclusion and Recommendation

This study examined the long run, short run and Causal relationship among GDP, agriculture, manufacturing, and services sectors. The study found the existence of long run relationship among the variables by applying VECM Model and Wald Test. The results show that there is long run Causality from agriculture, manufacturing and services to GDP in case of Pakistan.

The empirical results show that there is short run Causality from manufacturing and services to GDP and same applies for GDP to agriculture and manufacturing. There is no short run Causality from agriculture, manufacturing, and services to

GDP a similar trend has been observed from agriculture, services to manufacturing and agriculture, manufacturing and GDP to services in the case of Pakistan. Results of Granger Causality show that there is no direction Causality from agriculture and services to GDP and from manufacturing to agriculture and from services to manufacturing and vice versa. But there is uni-directional Causality from manufacturing to GDP and from services to agriculture.

The results reveal that there is unidirectional Causality running from sector shares to economic growth in Pakistan. Findings of this study imply that if agricultural and manufacturing will increase then it will increase the GDP of Pakistan, whereas, service does not influence the GDP of Pakistan individually on economic growth of Pakistan.

This study recommended that the Government of Pakistan should focus on services sector more than the other sector because there is no bidirectional Causality among services sector and other remaining sectors. There is unidirectional Causality from manufacturing to GDP and from services to agriculture by focusing on these sectors; these two countries can improve their economic growth. Because there is still a room for improvement in these sector.

Pakistan is an agriculture based country so should focus on this sector more because agriculture provides raw material for manufacturing. There is also need to improve the share of services sector, because in developed countries the share of services sector towards GDP is very high as compared to developing countries.

References

1. Alataweneh, H. M. (2012). Co-integration and Error Correction mechanism of agriculture and non-agriculture sectors in the Palestinian economy. *International Research Journal of Applied Life Sciences*, **1(3)**, 1-13.
2. Ali, R., Ali, A. K. A., Fatah, F. E. and Ariff, E. E. (2010). Linkages of macroeconomic indicators and agricultural variables in Malaysia. *Economic and Technology Management Review,* **5**, 1-9.
3. Awokuse, T. O. and Xie, R. (2015). Does agriculture really matter for economic growth in developing countries? *Canadian Journal of Agricultural Economics/Revue canadienned'agroeconomie*, **63(1)**, 77-99.

4. Behera, D. K. (2012). Economic growth and sectoral linkages: Empirical evidence from Odisha. *Journal of Regional Development and Planning*, **1(2)**, 91-102.
5. Blumenfeld, H. (1955). The economic base of the metropolis: Critical remarks on the "basic-nonbasic" concept. *Journal of the American Institute of Planners*, **21(4)**, 114-132.
6. Chakraborty, C. and Nunnenkamp, P. (2008). Economic reforms, FDI, and economic growth in India: A Sector Level Analysis, *World Development*, **36(7)**, 1192-1212.
7. Farooq, M. U., Sabir, H., Tahir, S. H. and Rasheed, M. K. (2013). Key factors affecting GDP in Pakistan. *Journal of Economics and Sustainable Development*, **4**, 142-149.
8. Gilaninia, S., Mousavian, S. J., Salimi, M. A., Zadeh, A. A., Makarehchian, A. and Seighalani, F. Z. (2012). Economic growth in Iran and effective factors on its changes. *Journal of Basic and Applied Scientific Research*, **2**, 986-994.
9. Guncavdi, O., Kucukcifci, S. and Bayar, A. A. (2013). Economic development and structural change: The role of the agriculture sector in Turkey. *Middle East Development Journal*, **5(2)**, 11-29.
10. Jatuporn, C., Chien, L. H., Sukprasert, P. and Thaipakdee, S. (2011). Does a long-run relationship exist between agriculture and economic growth in Thailand? *International Journal of Economics and Finance*, **3(3)**, 227-233.
11. Klosterman, R. (2009). Planning support system: Retrospect and Prospect. In: S. Geertman, J. Stillwell (eds). Planning Support System: Best Practices and New Methods. Springer Science and Business Media B. V, Berlin, Germany, pp. v-vii.
12. Lee, J. W. and McKibbin. J. W. (2014). Service sector productivity and economic growth in Asia. ADBI Working Paper 490. Tokyo: Asian Development Bank Institute. Retrieved from: http://www.adbi.org/workingpaper/2014/07/18/6358.service.sector.productivity/
13. Matahir, H. (2012). The empirical investigation of the nexus between agricultural and industrial sectors in Malaysia. *International Journal of Business and Social Science*, **3**, 225-231.
14. Mujahid, H. and Alam, S. (2014). Service sector as an engine of growth: Empirical analysis of Pakistan. *Asian Economic and Financial Review*, **4(3)**, 377-386.
15. Rahman, M. M., Rahman, M. S. and Hai-bing, W. (2011). Time Series analysis of Causal relationship among GDP, agriculture, industrial and services sector growth in Bangladesh. *China-USA Business Review*, **10**, 9-15.

16. Singh, I. (2014). Service sector and economic growth in Punjab. Centre for Development Economics and Innovation Studies (CDEIS), Punjabi University. Discussion Paper No. 8
17. Srikanth, P. and Sathyanarayana, K. (2011). Co-Integration and Causal relationship between GDP and agriculture sector. *International Journal of Research in Commerce and Management*, **2**, 66-68.
18. Szirmai, A. (2011). Industrialization as an engine of growth in developing countries, 1950–2005. *Structural Change and Economic Dynamics*, **23**, 406-420.
19. Tandrayen-Ragoobur, V. (2010). The services sector and economic growth in Mauritius: A bounds testing approach to Co-integration. *University of Mauritius Research Journal*, **16(1)**, 313-331.
20. Tang, T. C. (2002). Inter-sectoral integration in Malaysian economic transition and change: A Co-integration analysis. *Analysis*, **9(1 and 2)**, 47-61.
21. Wang, M. (2009). Manufacturing FDI and economic growth. *Journal of Applied Economics*, **41**, 991-1002.
22. Weimer, A. M. and Hoyt, H. (1948). *Principles of Real Estate.* Roland Press Company, New York.

Appendix

Table 1: Descriptive statistics

	GDP	AGRICULTURE	MANUFACTURING	SERVICES
Mean	4.091667	24.75000	23.54167	51.66667
Median	4.150000	25.00000	24.00000	51.00000
Maximum	7.700000	27.00000	27.00000	56.00000
Minimum	1.000000	21.00000	20.00000	49.00000
Std. Dev.	1.906492	1.750776	1.841058	2.530968
Skewness	0.351639	-0.353800	-0.152996	0.548487
Kurtosis	2.411866	2.041195	2.528423	1.864581
Jarque-Bera	0.840500	1.420005	0.316016	2.492528
Probability	0.656883	0.491643	0.853843	0.287577
Sum	98.20000	594.0000	565.0000	1240.000
Sum Sq. Dev.	83.59833	70.50000	77.95833	147.3333
Observations	24	24	24	24

Table 2: Stationary of GDP (1st Difference)

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-5.414576	0.0013
Test critical values:	1% level	-4.440739	
	5% level	-3.632896	
	10% level	-3.254671	

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP,2)
Method: Least Squares
Sample (adjusted): 1991 2012

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-1.220496	0.225409	-5.414576	0.0000
C	-0.094999	1.061325	-0.089510	0.9296
@TREND(1989)	0.004018	0.075719	0.053062	0.9582

R-squared	0.606917	Mean dependent var	0.077273
Adjusted R-squared	0.565540	S.D. dependent var	3.418010
S.E. of regression	2.252933	Akaike info criterion	4.588467
Sum squared resid	96.43843	Schwarz criterion	4.737245
Log likelihood	-47.47313	Hannan-Quinn criter.	4.623514
F-statistic	14.66793	Durbin-Watson stat	2.066136
Prob. (F-statistic)	0.000140		

Table 3: Stationary of agriculture (1st Difference)

Null Hypothesis: D(AGRICULTURE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=5)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-4.824213	0.0045
Test critical values:	1% level	-4.440739	

	5% level	-3.632896
	10% level	-3.254671

Table 4: Stationary of manufacturing (1st Difference)

Null Hypothesis: D(MANUFACTURING) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic based on SIC, MAXLAG=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.804756	0.0051
Test critical values:	1% level	-4.467895	
	5% level	-3.644963	
	10% level	-3.261452	

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MANUFACTURING,2)
Method: Least Squares
Sample (adjusted): 1992 2012
Included observations: 22 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
D(MANUFACTURING(-1))	-1.589140	0.330743	-4.804756	0.0002
D(MANUFACTURING(-1),2)	0.434930	0.221046	1.967595	0.0656
C	-0.019140	0.834168	-0.022945	0.9820

R-squared	0.630323	Mean dependent var	0.047619
Adjusted R-squared	0.565086	S.D. dependent var	2.438774
S.E. of regression	1.608323	Akaike info criterion	3.957905
Sum squared resid	43.97396	Schwarz criterion	4.156861
Log likelihood	-37.55800	Hannan-Quinn criter.	4.001083
F-statistic	9.662030	Durbin-Watson stat	1.810392
Prob(F-statistic)	0.000595		

Table 5: Stationary of services (1st Difference)

Null Hypothesis: D(SERVICES) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic based on SIC, MAXLAG=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.005997	0.0034
Test critical values:	1% level	-4.467895	
	5% level	-3.644963	
	10% level	-3.261452	

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SERVICES,2)
Method: Least Squares
Sample (adjusted): 1992 2012
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SERVICES(-1))	-1.510880	0.301814	-5.005997	0.0001
D(SERVICES(-1),2)	0.533646	0.225501	2.366494	0.0301
C	0.433306	0.725045	0.597626	0.5580

R-squared	0.621928	Mean dependent var	0.047619
Adjusted R-squared	0.555210	S.D. dependent var	2.085094
S.E. of regression	1.390603	Akaike info criterion	3.666996
Sum squared resid	32.87422	Schwarz criterion	3.865953
Log likelihood	-34.50346	Hannan-Quinn criter.	3.710175
F-statistic	9.321677	Durbin-Watson stat	1.896249
Prob(F-statistic)	0.000716		

Table 6: Johansen Cointegration Test
Sample (adjusted): 1991 2012
Included observations: 22 after adjustments
Trend assumption: Linear deterministic trend
Series: GDP MANUFACTURING SERVICES AGRICULTURE
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None *	0.721478	56.87925	47.85613	0.0057
At most 1	0.580861	28.75753	29.79707	0.0655
At most 2	0.302500	9.627380	15.49471	0.3105
At most 3	0.074440	1.701832	3.841466	0.1920

Trace test indicates 1 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.
None *	0.721478	28.12172	27.58434	0.0427
At most 1	0.580861	19.13015	21.13162	0.0931
At most 2	0.302500	7.925548	14.26460	0.3863
At most 3	0.074440	1.701832	3.841466	0.1920

Max-eigenvalue test indicates 1 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

GDP	MANUFACTURING	SERVICES	AGRICULTURE
0.681063	4.674830	5.232874	5.380164
0.546524	-4.469145	-3.936789	-3.474855
0.533153	3.539638	3.232090	2.969529
0.074291	0.654489	0.357023	0.880830

Unrestricted Adjustment Coefficients (alpha):

D(GDP)	-0.471167	-1.364747	-0.277784	0.046101
D(MANUFACTURING)	0.684471	-0.083964	-0.619199	-0.065756
D(SERVICES)	-0.483570	0.203182	0.399843	0.236699
D(AGRICULTURE)	-0.402272	0.072951	0.125336	-0.182899

1 Cointegrating Equation(s): Log likelihood -103.5489

Normalized cointegrating coefficients (standard error in parentheses)

GDP	MANUFACTURING	SERVICES	AGRICULTURE
1.000000	6.864020	7.683392	7.899656
	(1.57969)	(1.51205)	(1.43413)

Adjustment coefficients (standard error in parentheses)

D(GDP)	-0.320895
	(0.32197)
D(MANUFACTURING)	0.466168
	(0.20982)
D(SERVICES)	-0.329342
	(0.20450)
D(AGRICULTURE)	-0.273973
	(0.12888)

2 Cointegrating Equation(s): Log likelihood -93.98378

Normalized cointegrating coefficients (standard error in parentheses)

GDP	MANUFACTURING	SERVICES	AGRICULTURE
1.000000	0.000000	0.889970	1.393253
		(0.14439)	(0.19928)
0.000000	1.000000	0.989715	0.947900
		(0.01999)	(0.02759)

Adjustment coefficients (standard error in parentheses)

D(GDP)	-1.066762	3.896623
	(0.28575)	(2.11635)
D(MANUFACTURING)	0.420279	3.575034
	(0.26839)	(1.98780)
D(SERVICES)	-0.218298	-3.168660
	(0.25842)	(1.91391)
D(AGRICULTURE)	-0.234103	-2.206583
	(0.16448)	(1.21815)

3 Cointegrating Equation(s):	Log likelihood	-90.02101	

Normalized cointegrating coefficients (standard error in parentheses)

GDP	MANUFACTURING	SERVICES	AGRICULTURE
1.000000	0.000000	0.000000	0.046289
			(0.29800)
0.000000	1.000000	0.000000	-0.550029
			(0.32210)
0.000000	0.000000	1.000000	1.513495
			(0.32763)

Adjustment coefficients (standard error in parentheses)

D(GDP)	-1.214863	2.913369	2.009338
	(0.32718)	(2.35763)	(2.33522)
D(MANUFACTURING)	0.090152	1.383295	1.910994
	(0.27167)	(1.95766)	(1.93905)
D(SERVICES)	-0.005120	-1.753360	-2.038019
	(0.28498)	(2.05358)	(2.03405)
D(AGRICULTURE)	-0.167280	-1.762938	-1.987134
	(0.19002)	(1.36931)	(1.35629)

Table 7: Error Correction Model

Method: Least Squares
Sample (adjusted): 1992 2012
Included observations: 21 after adjustments
D(GDP) = C(1)*(GDP(-1) - 5.50297574983*AGRICULTURE(-1) - 6.15893053588*MANUFACTURING(-1) - 5.74688642366*SERVICES(-1) + 574.069646492) + C(2)*D(GDP(-1)) + C(3)*D(GDP(-2)) + C(4) *D(AGRICULTURE(-1)) + C(5)*D(AGRICULTURE(-2)) + C(6) *D(MANUFACTURING(-1)) + C(7)*D(MANUFACTURING(-2)) + C(8) *D(SERVICES(-1)) + C(9)*D(SERVICES(-2)) + C(10)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-1.008878	0.271941	-3.709914	0.0034
C(2)	0.155437	0.230157	0.675352	0.5134
C(3)	0.608085	0.331192	1.836049	0.0935
C(4)	-3.254357	1.499361	-2.170497	0.0527
C(5)	-1.445651	1.112609	-1.299334	0.2204

C(6)	-4.919953	1.988106	-2.474693	0.0309
C(7)	0.074048	1.287442	0.057516	0.9552
C(8)	-4.843777	1.857303	-2.607963	0.0243
C(9)	0.571660	1.229964	0.464778	0.6512
C(10)	-0.315131	0.377506	-0.834769	0.4216

R-squared	0.724312	Mean dependent var	-0.052381
Adjusted R-squared	0.498749	S.D. dependent var	2.246246
S.E. of regression	1.590322	Akaike info criterion	4.071504
Sum squared resid	27.82035	Schwarz criterion	4.568895
Log likelihood	-32.75079	Hannan-Quinn criter.	4.179450
F-statistic	3.211127	Durbin-Watson stat	2.250738
Prob(F-statistic)	0.036125		

Table 8: Wald Test

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	2.431141	(2, 11)	0.1336
Chi-square	4.862282	2	0.0879

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(4)	-3.254357	1.499361
C(5)	-1.445651	1.112609

Restrictions are linear in coefficients.

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	3.887962	(2, 11)	0.0528
Chi-square	7.775924	2	0.0205

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(6)	-4.919953	1.988106
C(7)	0.074048	1.287442

Restrictions are linear in coefficients.
Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	4.088919	(2, 11)	0.0470
Chi-square	8.177838	2	0.0168

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(8)	-4.843777	1.857303
C(9)	0.571660	1.229964

Table 9: Granger Causality Test

Pairwise Granger Causality Tests
Sample: 1989 2012
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
AGRICULTURE does not Granger Cause GDP	23	0.35793	0.5564
GDP does not Granger Cause AGRICULTURE		1.43063	0.2457
MANUFACTURING does not Granger Cause GDP	23	4.81925	0.0401
GDP does not Granger Cause MANUFACTURING		3.3E-06	0.9986
SERVICES does not Granger Cause GDP	23	0.65020	0.4295
GDP does not Granger Cause SERVICES		2.55293	0.1258
MANUFACTURING does not Granger Cause AGRICULTURE	23	0.02751	0.8699
AGRICULTURE does not Granger Cause MANUFACTURING		2.89216	0.1045

SERVICES does not Granger Cause AGRICULTURE	23	0.18338	0.6731
AGRICULTURE does not Granger Cause SERVICES		4.84257	0.0397