Relationship between Sectors Shares and Economic Growth in Palestine

Dr. Haroon Mohammed Alataweneh

PhD in Agricultural Economics

Hebron Directorate of Agriculture

Palestinian Disaster Risk Reduction and Insurance Fund (PADRRIF)

P.O Box23 –Hebron, Palestine

E-mail: haroon_atd@hotmail.com

Abstract

This study estimates an econometric model that incorporates the linkages among agriculture, manufacturing, non-manufacturing, and service sectors using a vector error correction model for Palestine. Three co-integrating vectors confirm that the different sectors in the Palestinian economy moved together over the sample period, and for this reason, their growth rates are interdependent. But, in the short run, agriculture in Palestine seems to have a partial role as a driving force in the growth of other non-agricultural sectors. The results of improved quality of services and restructuring the banking indicate that the agricultural sector fully benefit from the development of the commerce and services sector and the presence of credit market constraints could not hamper growth of agricultural output in Palestine.

Keywords: Palestine, Palestinian Economy, Agriculture, Non-agricultural Sectors

1. Introduction

The agricultural sector is more than simply a pillar of the Palestinian economy; for Palestinians, it represents social, historical, and national intangibles that extend far beyond its economic importance. The agriculture sector rep-resents a direct connection between Palestinians and their land; it represents independence, self-sufficiency, and Palestinian heritage.

Over the past four decades the Palestinian economy including agriculture sector experienced the impacts of different difficulties and shocks along phases of conflicts in the area.Until the late

1980s, the agricultural sector's contribution to Palestinian GDP more than 30%. This share has experienced a dramatic fall during the past decade. In 1990 agriculture represented 35% of GDP, but declined steadily and fell to an historic low of 7% by 2000 (UNCTAD, 2001) and (PARC, 2005).

Over the past decade, evidence suggests that Palestine's economic performance has been one of the modest in the region, reflecting gradual structural reforms, well macroeconomic policies and well-targeted social policies. Real growth averaged 4.1% in the 1990s, and inflation is slowing at 4%. Despite of; the change and diversification observed in the Palestine economy, the agricultural sector remains economically, politically and socially important for its contribution to the achievement of national objectives as regards to food security, employment, regional equilibrium and social cohesion.

As a government policy objective, Palestine needs its agriculture, to maintain employment and export earnings. In fact, agricultural sector generates around 8.2% of total GDP, employs 14.2% of total labour force and agro-food exports represent around 23% of total exports. Although the high importance placed on the agricultural sector, in context of Palestine economy, the issue of the agricultural contribution to the national economic growth has often been evoked by policy makers but rarely examined empirically till now.

Traditional quantitative study of sectoral linkages depends either on an input–output model or a computable general equilibrium model (CGE) or a mix of the two. Both the models require a large amount of data and suffer from many other disadvantages, such as the lack of dynamism and an inability to delineate the effects of policy and technical change over time. On the other hand, an econometric model requires less data and is able to capture the short-run as well as long-run effects of agricultural production on the rest of the economy.

However, conventional econometric models using the ordinary least squares method (OLS) may yield spurious regression results if the time-series data are not cointegrated. To ensure that OLS regression does not generate undesirable results, one has to test whether the different sets of time-series data are cointegrated. A vector autoregression (VAR) model developed in Johansen and Juselius is particularly useful for this purpose (Johansen and Juselius, 1992).

Although several studies have outlined the theoretical and empirical relationships between agriculture and economic growth, disagreements still presents and the causal dynamics between agriculture and economic growth is an empirical debate, as described by Awokuse (2009).

Tsakok and Gardner (2007) showed empirical analyses on the role of agriculture in economic growth and argue that early works based on econometric study of cross-sectional data for a panel of countries, or possibly regions within a country, have significant limitations and have not provided definitive results. In particular, given the presence of non-stationarity, conventional regression techniques may yield spurious regressions and significance tests. Also, the results are limited to showing only that agriculture and GDP growth are correlated, but could not provide information on the direction of causality. Awokuse (2009) notes that the issue of causality is dynamic in nature and is best examined using a dynamic time series-modeling framework.

Gardner (2003) studied in a cross-sectional panel of 52 developing countries and discovered no significant evidence of agriculture leading overall economic growth. However, Tiffin and Irz (2006), using cointegration framework and Granger-causality tests on data for 85 countries, find statistical evidence that supports the conclusion that agricultural value added is the causal variable in developing countries, while the direction of causality in developed countries is unclear.

Yao (2000) demonstrated how agriculture has contributed to China’s economic development using both empirical data and a cointegration analysis. He drawn two important conclusions: firstly, although agriculture's share in GDP declined sharply over time, it is still an important force for the growth of other sectors. Second, the growth of non-agricultural sectors had little effect on agricultural growth. This was largely due to government policies biased against agriculture and restriction on rural-urban migration.

In addition, it is important to note that with advances in time series econometric techniques, Kanwar (2000) and Chaudhuri and Rao (2004) recommend that in estimating the relationship between agricultural and non-agricultural sectors the former should not be assumed to be exogenous, rather, this should first be established. Kanwar (2000) investigated the cointegration of the different sectors of the Indian economy (namely, agriculture, manufacturing industry, construction, infrastructure, and services) in a vector autoregressive (VAR) framework to circumvent problems of spurious regressions given the presence of non-stationarity data.

Katircioglu (2006) analyzed the relationship between agricultural output and economic growth in North Cyprus using cointegration. He used annual data covering the 1975-2002 period, to find the direction of causality in Granger sense between agricultural growth and economic growth. His empirical results suggests that agricultural output growth and economic growth as measured by real GDP growth are in long-run equilibrium relationship and there is feedback relationship between these variables that indicates bidirectional causality among them in the long-run period. The author concludes that agriculture still has an impact on the economy although North Cyprus suffers from political problems and drought.

Chebbi (2010), in his country specific study, investigated cointegration among the sectors by using data from 1961 to 2007 and showed that all Tunisian economic sectors cointegrated and tend to move together. Furthermore, weak exogeneity for the agricultural sector is rejected.

However, in the short run, agriculture in Tunisia seems to have a partial role as a driving force in the growth of other non-agricultural sectors and agricultural growth may be conducive only to the agro-food industry sub-sector.

All these above studies have made useful contributions to understanding the links between different sectors in the economy and economic growth. These studies further imply that the contribution of agricultural growth to economic development varies markedly from country to country as well as from one time period to another within the same economy. However, there is a significant gap in the growth literature because most of the inter-sectoral linkage studies were conducted for the developed countries. Furthermore, no research was conducted for Arab Countries. In an attempt to fill the gap in the literature, this study focuses on how the agricultural sector has been inter-related to rest of the economy in Palestine.

2. Methodology

The time-series data of national income indices in constant prices of the four sectors over 1994–2011 (Palestinian Central Bureau of Statistics, 2011) are used in setting up the model. Although the number of observations (18) is small for a VAR model, the data provides the longest possible time-series for the Palestinian economy. All variables are in constant US$ (1994) and transformed in logarithms so that they can be interpreted in growth terms after taking first difference. Let x_t denote a (4×1) column vector of the logs of national income indices for agriculture and fishing (YA), manufacturing industry (YMAN), Non-manufacturing industry (YNMAN) and services (YS). The VAR model as in Johansen and Juselius (1992) is replicated by Equation 1:

$$\Delta X_t = \sum_{i=1}^{p} \Pi_i \Delta X_{t-i} + \Pi X_{t-} + \Psi Z_t + \varepsilon_t \qquad (1)$$

where Π_i's (i = 1, ..., p) are (4×4) matrixes for the short-run variables $\Delta Xt{-}i$; ΔXt are a (4×1) column vector of the first differences of X_t; Π is a (4×4) matrix for the long-run variables X_{t-1} which is a (4×1) column vector of the lagged dependent variables; Z_t is a (4×s) matrix containing s deterministic variables (such as a time trend, a constant, and any other exogenous variables with *I(0)* property) for each dependent variable; ε_t is a (4×1) column vector of disturbance terms normally distributed with zero means and constant variances.

The first term in Equation 1 will capture the short-run effects of ΔX_t. The lagged length (i.e. the value of p) is taken arbitrarily simply to insure that the residuals have the desired properties. In this model, it is found that $p = 1$ will be sufficient.

The second term in Equation 1 will capture the long-run effects on ΔX_t. As the long-run effects are our main concerns of this study, it is necessary to understand the meaning of the coefficient matrix Π. usually, Π can be factored into $\alpha\beta'$where both α and β are (4×r) matrices of rank r (4≥r≥0). The value of r indicates the number of cointegration vectors among X_t. The cointegration vectors can be written as $\beta' X_t$. All these vectors will be integrated of degree zero, or *I(0)*, although all the elements in X_t are integrated of degree one, or *I(1)*. The loading matrix a gives the weights attached to each cointegration vector for all the equations.

The number of distinct co-integrating vectors can be obtained by checking the significance of the characteristic roots of Π. This means that the rank of matrix is equal to the number of its characteristic roots that differ from zero. The test for the number of characteristics roots that are insignificantly different from unity can be conducted using the following test statistics:

$$\lambda_{trace}(r) = -T \sum_{i=r=1}^{n} \ln\,(1-\hat{\lambda}_i) \qquad (2)$$

$$\lambda_{max}(r, r+1) = -T \sum_{i=r=1}^{n} ln\,(1-\hat{\lambda}_{r+1}) \qquad (3)$$

where $\hat{\lambda}$ is the estimated values of the characteristics roots (called eigenvalues) obtained from the estimated matrix Π and T is the number of usable observations. The first, called the trace test, tests the hypothesis that there are at most r cointegrating vectors. In this test, λ_{trace} equals zero when all λ_i are zero. The further the estimated characteristic roots are from zero, the more negative is $\ln(1-\hat{\lambda}_i)$ and the larger the λ_{trace} statistic. The second, called the maximum eigenvalue test, tests the hypothesis that there are r cointegrating vectors versus the hypothesis that there are r+1 cointegrating vectors. This means if the value of characteristic root is close to zero, then the λ_{max} will be small.

3. Estimation and Results

Figure 1 and 2 shows that the four selected variables in the Palestinian economy tend to move together over time and long run or co-integrating relationships are likely to be present in this case.

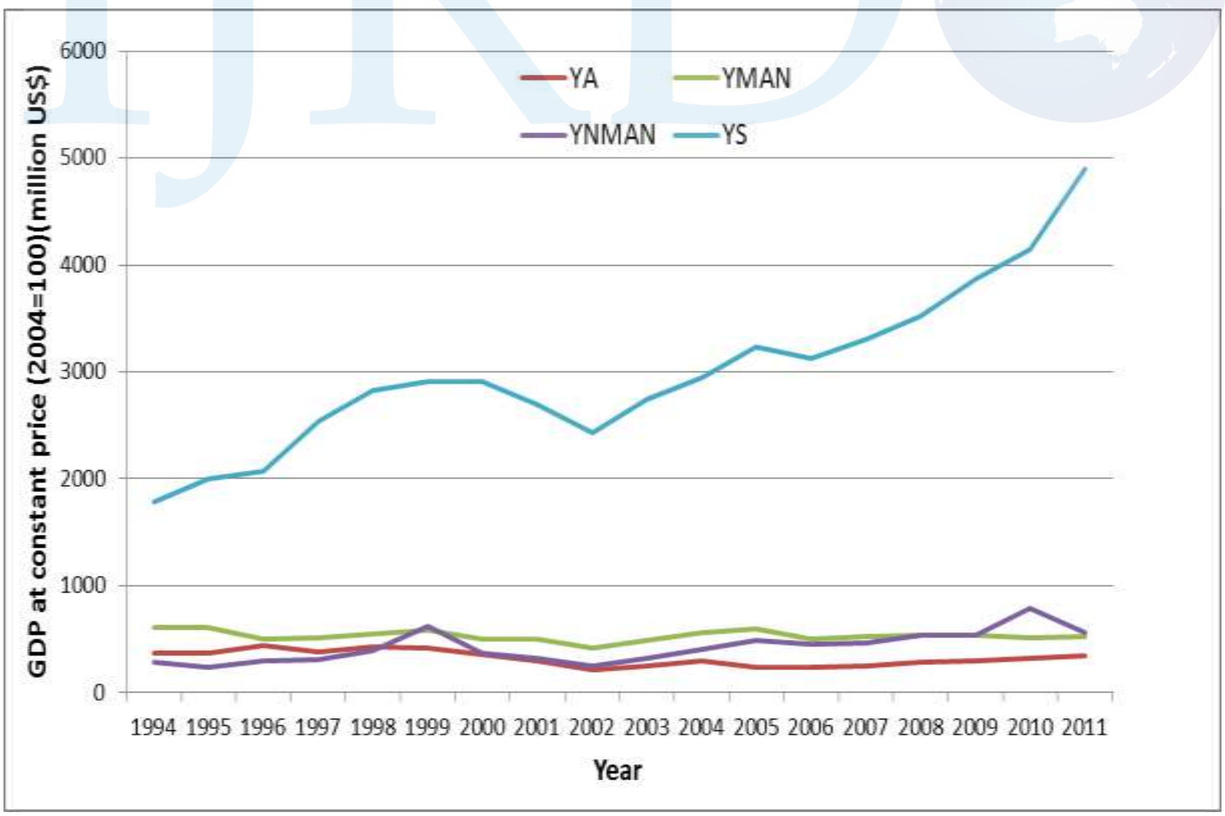

Figure 1. Trends of the index series

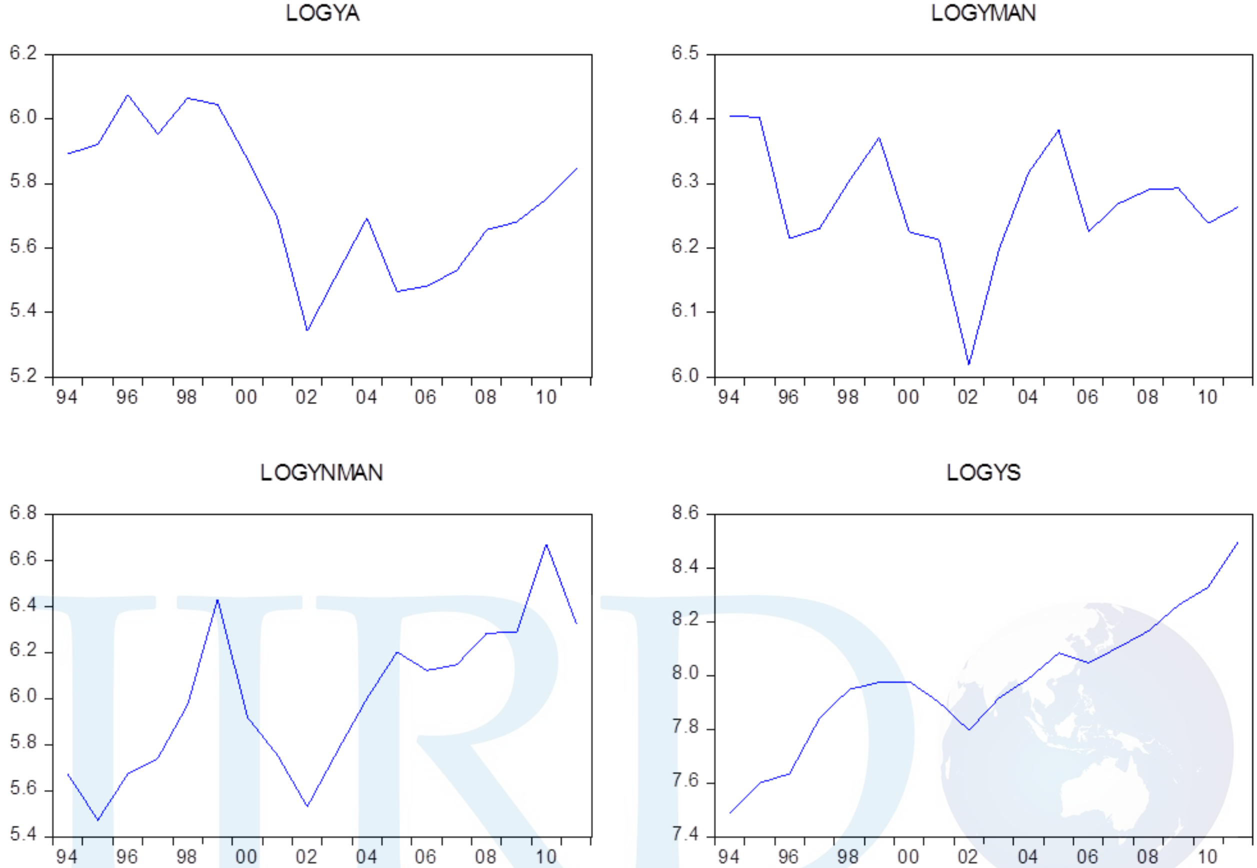

Figure 2. Plots of (the logs of) variables YA, YMAN, YNMAN, YS against time in levels.

Unit-root and order of integration analysis

The first step in this analysis is to explore the univariate properties and to test the order of integration of each time series. The Augmented Dickey Fuller (ADF) test (Dickey and Fuller, 1979, 1981) and Phillips-Perron(PP) tests are used to perform unit root tests. The analysis shows that all the four variables failed to reject the unit root hypothesis at levels and rejected at the first-differences for agriculture, manufacture and non-manufacture sectors (Table 1). Only service sector confirmed stationary at second difference. The results show that the series are integrated at the first order, *I(1)* for agriculture, manufacture and non-manufacture sectors and second order II(*I*) for service sector which also be indicated by the figure 3.

Table 1. Augmented Dickey-Fuller (ADF) test and Phillips-Perron(PP)for unit roots (τ- values)

Variables	Sectoral national income indices in logs and levels		First/Second differences of sectoral national income indices in logs	
	ADF	PP	ADF	PP
YA: Real GDP of agricultural sector	-1.246	-1.246	-3.614	-3.633
YMAN: Real GDP of manufacturing industry	-2.923	-2.812	-4.789	-5.591
YNMAN: Real GDP of non-manufacturing industry(Mining and quarrying, electricity and water and construction)	-2.622	-2.622	-4.000	-4.001
SER: Real GDP of service sector	-2.734	-1.798	-5.197 (II)	-6.548 (II)

Notes: The critical values of τ -Value: 10% = - -3.322, 5% = -3.761, 1% = -4.731. * , ** and *** denote rejection (of non-stationarity) at the10%, 5% and 1% significant levels respectively.

The summary statistics of the sectoral GDP indices in logarithms and their first differences are presented in Table 2. It is interesting to note that agriculture has a modest correlation with the rest of the economy in level terms and in the first difference terms. As the GDP indices are found to be *I(1) and* II (*I*) it is the relationship between the first differences that is of importance and relevance. Without doing any cointegration analysis, the correlation matrix at the lower panel of Table 2 provides some interesting information. First, all the sectors appear to be relatively higher and positive relation. Second, agriculture seems to go its own way, with a moderate and positive relationship with manufacture sector; and strong and positive relationship with non-manufacture and service sectors.

Figure 3. GDP at constant prices (2004=100) of variables YA, YMAN, YNMAN, YS against time in first difference.

Table 2. Summary statistics of sectoral national income indices (1994-2011)

Levels	YA	YMAN	YNMAN	YS
Mean	5.749	6.270	5.997	7.974
Standard deviations	0.223	0.092	0.332	0.254
Correlation matrix				
YA	1.000			
YMAN	0.045	1.000		
YNMAN	0.513	0.700	1.000	
YS	0.254	0.198	0.249	1.000
First differences	ΔYA	ΔYMAN	ΔYNMAN	ΔYS
Mean	-0.002	-0.008	0.038	0.059
Standard deviations	0.154	0.107	0.263	0.080
Correlation matrix				
ΔYA	1.000			
ΔYMAN	0.393	1.000		
ΔYNMAN	0.633	0.703	1.000	
ΔYS	0.511	0.956	0.771	1.000

Examination on the companion matrix, different residual tests (mean, standard deviations, autocorrelation and normality) the L-max and L-trace test statistics indicates that there are three co-integrating vectors (r = 3). With one lagged differences all the residuals have the desired properties. Some major statistics from the residual analysis are presented in Table 3. Figure 4 for residuals, also suggests that there are no major problems in the data set.

Table 3. Statistics from the residual analysis

Equation	Mean	Standard deviation	Normality[1]	Probability
YA	0.000	0.095	1.201	0.548
YMAN	0.000	0.074	1.690	0.429
YNMAN	0.000	0.191	0.766	0.681
YS	0.000	0.036	0.943	0.623

[1] It is the value of Jarque Bera normality test values.

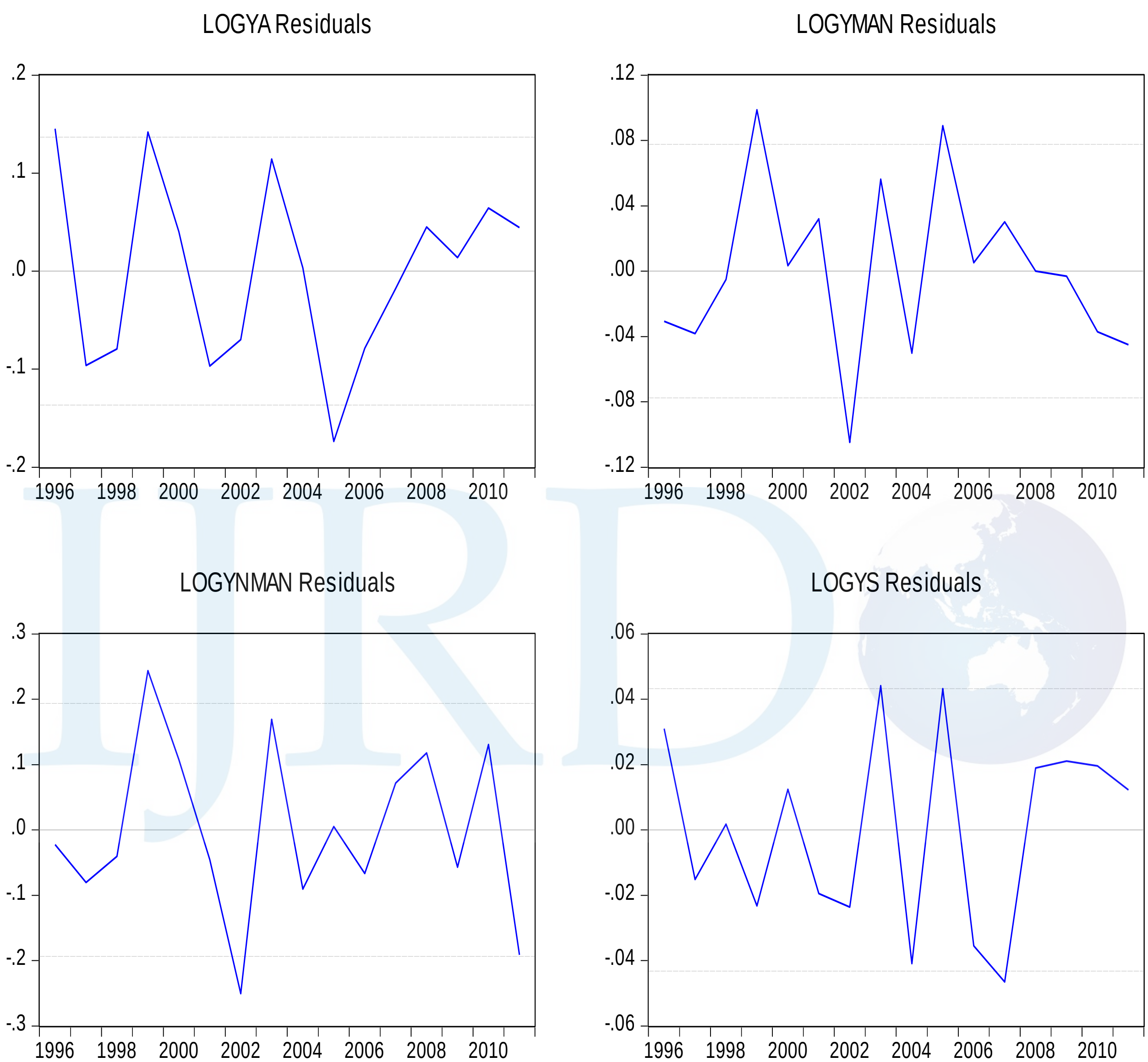

Figure 4. Residual plots

It is observed from Table 4, the max and trace tests fail to reject the null of three co-integrating vector (r = 3) among the four variables at the 5% significance level. This is because of the number of cointegration vectors (r) is equal to the number of equations (n=4) minus the number of roots (p = 1) in the companion matrix. In all the following analyses, we assume that there is present of three stationary or co-integrating relation and one common stochastic trends in the system. The presence of three co-integrating vector provides evidence that there is three process that separates the long run from the short-run responses of the Palestinian economy. As Kanwar (2000) notes that this does not imply that some of the sectors did not outpace the others, but only that the economic forces at work functioned in such a way as to tie together these sectors in a long-run structural equilibrium, and while short-run shocks may have led deviations from this long-run path, forces existed whereby the system reverted back to it. Their estimates are presented in Table 4a and 4b along with the corresponding adjustment matrix a, where b is presented in normalized form. The one cointegrating vectors have been normalized by SER

.

The cointegration vector reveals a positive and long-run relationship between transport, storage and communication sector output and agricultural and non manufacturing industry output and a negative linkage between transport, storage, and communication sector and manufacturing industry sector output and services sector output in Palestine. A closer examination of the negative sign between TSC and MAN; TSC and SER may indicate that the development of the transport, storage and communication sector in Palestine was achieved at the expense of the industrial and service sectors.

Table 4a. Evidence of cointegration using maximal eigenvalue and trace statistical tests for all four sectors in Palestine

Hypotheses			Eigen value	Maximum eigne value test			Trace statistical test		
H_0	H_1^1	H_1^2		λ_{max}	5% critical value	1% critical value	λ_{trace}	5% critical value	1% critical value
r = 0	r = 1	r ≤ 1	0.981*	63.57	32.19		126.07*	63.87	
r = 1	r = 2	r ≤ 2	0.895*	36.12	25.82		62.50*	42.91	
r = 2	r = 3	r ≤ 3	0.716*	20.18	19.38		26.37*	25.87	
r = 3	r = 4	r ≤ 4	0.320	6.19	12.51		6.19	12.51	

* denotes reject the null hypothesis at 5% level of significance. [1, 2] denote alternative hypothesis for maximum eigenvalue and trace statistical tests, respectively.

Table 4b. Normalized cointegration relations (β) and loading coefficients (α)

$$\alpha = \begin{pmatrix} -1.407 & -0.596 & 0.679 \\ (0.737) & (0.529) & (0.339) \\ 0.254 & -1.496 & 0.493 \\ (0.762) & (0.547) & (0.351) \\ 0.602 & 1.205 & -1.447 \\ (2.027) & (1.456) & (0.934) \\ 3.581 & -3.733 & 2.944 \\ (3.174) & (2.279) & (1.463) \end{pmatrix}$$

$$\beta = \left[\begin{pmatrix} 1.00 & 0.00 & 0.00 & -0.165 \\ 0.00 & 1.00 & 0.00 & -0.131 \\ 0.00 & 0.00 & 1.00 & -0.381 \end{pmatrix} \begin{pmatrix} LYA_{t-1} \\ LYMAN_{t-1} \\ LYNMAN_{t-1} \\ LYS_{t-1} \end{pmatrix} + \begin{pmatrix} -0.157 \\ 1.128 \\ 2.922 \end{pmatrix} TREND_{t-1} \right]$$

Granger non-causality study

Since cointegration relationships were found between the variables, we next drive to investigate the direction of causality by estimating a VECM derived from the long-run cointegrating relationship (Engle and Granger, 1987; Granger, 1988). The vector error correction model contains the cointegration relation built into the specification so that it restricts the long-run behavior of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics.

The short run Granger causality test indicates that there are no causal relationships between AGR and MAN, and AGR and YNMAN sectors (Table 5). The causal linkage between agricultural growth and service sector growth in the short run, the results provide support for causality running from SER to AGR. Support for reverse causality is not found in the short run and growth of AGR does not generate any significant effects on SER sector.

This unidirectional causality running from SER to growth in the agricultural sector may indicate that agriculture in Palestine is a service dependent sector.

Table 5. Results of non-causality tests between agriculture and non-agricultures sectors

Hypothesis of non-causality	Short run Granger non-causality
H_0: LOGYMAN does not Granger Cause LOGYA	0.029
H_0: LOGYA does not Granger Cause LOGYMAN	2.301
H_0:LOGYNMAN does not Granger Cause LOGYA	0.178
H_0: LOGYA does not Granger Cause LOGYNMAN	1.513
H_0: LOGYS does not Granger Cause LOGYA	2.881*
H_0: LOGYA does not Granger Cause LOGYS	1.379

* Rejection of hypotheses H_0 at 10% levels of significance

4. Conclusion

Although in the past, high importance is placed on the agricultural sector in Palestine, the matter of agricultural contribution to economic growth has often been raised by policymakers but rarely examined empirically. In this paper, annual data covering from 1994-2009 period were used to explore cointegration relationships and the direction of causality between growth in the agricultural sector and growth in the other sectors, namely, the manufacturing industry; the non-manufacturing industry; the transportation, storage telecommunication sector and the services sector.

Findings from the analysis of the long-run relationships confirm that the different sectors of the Palestinian economy moved together over the sample period and, for this reason, their growth was interdependent. The analysis also shows that there is one long-run cointegrating relationship for Palestine economy.

The findings from non-causality tests indicate that the agricultural sector seems to have a partial role in the short run as a driving force in the growth of other non-agricultural sectors of the Palestine economy. This may be the result of the relative decrease of the role that the agricultural sector plays as provider of inputs for the Palestinian industry and other sectors and the consequence of the traditional Palestinian export strategy with low value-added products.

In addition, the Palestine government also started improving the quality of services and restructuring the banking sector, that also supported our statistical results which indicate that the agricultural sector fully benefit from the development of the commerce and services sector and the presence of credit market constraints could not hamper growth of agricultural output and productivity in Palestine.

References

Awokuse, T.O. (2009). Does agriculture really matter for economic growth in developing countries? Paper presented at the American Agricultural Economics Association Annual Meeting, Milwaukee, WI, July 26-28.

Chaudhuri, K. and Rao, R.K. (2004). Output fluctuations in Indian agriculture and industry: a reexamination. *Journal of Policy Modeling*, Vol. 26, No. 2, pp. 223-37.

Chebbi, H.E. (2010). Agriculture and economic growth in Tunisia. *China Agricultural Economic Review*, Vol. 2, No. 1, pp. 63-78.

Dickey, D. A. and Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, Vol. 74, pp. 427-431.

Dickey, D. A. and Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica*, Vol. 49, No. 4, pp. 1057-1072.

Engel, R. E. and Granger, C.W. J. (1987). Cointegration and error correction: representation, estimation and testing. *Econometrica*,Vol. 55, pp. 251-76.

Gardner, B. (2003). Causes of rural economic development. Paper presented at the 25th International Conference of Agricultural Economists, Durban, August 16-22.

Granger, C.W.J. (1988). Developments in a concept of causality. *Journal of Econometrics*, Vol. 39, pp. 199-211.

Johansen, S. and Juselius, K. (1992). Testing structural hypotheses in a multivariate cointegration analysis of the PPP and the UIP for UK. *Journal of Econometrics*, Vol. 53 Nos. 1-3, pp. 211-44.

Kanwar, S. (2000). Does the dog wag the tail or the tail the dog? Cointegration of Indian agriculture with non-agriculture. *Journal of Policy Modeling*, Vol. 22, No. 5, pp. 533-56.

Katircioglu, S.T. (2006). Causality between agriculture and economic growth in a small nation under political isolation: a case from North Cyprus. *International Journal of Social Economics*, Vol. 33, No. 4, pp. 331-43.

Palestinian Agricultural relief Committee (PARC), (2005). Agriculture is a key Pillar in the Palestinian Economy. http://www.grassrootsonline.org/weblog/palag.html.

Palestinian Central Bureau of Statistics (PCBS), (2011). Value added by the economic activity for the years 1994-2009 at constant prices: 2004 is the base year. Palestine National Authority, Ramallah, Palestine. (http://www.pcbs.gov.ps).

Tiffin, R. and Irz, X. (2006). Is agriculture the engine of growth? *Agricultural Economics*, Vol. 35, No. 1, pp. 79-89.

Tsakok, I. and Gardner, B. (2007). Agriculture in economic development: primary engine of growth or chicken and egg? *American Journal of Agricultural Economics*, Vol. 89, No. 5, pp. 1145-51.

United Nations Conference on Trade and Development (UNCTAD), (2001). The Palestinian Economy: Achievements of the Interim Period and Tasks for the Future, UNCTAD/GDS/APP/1, Geneva, United Nations, pp.1-13, (http://www.unctad.org/).

Yao, S. (2000). How important is agriculture in China's economic growth? *Oxford Development Studies*, Vol. 28, No. 1, pp. 33-49.