Agriculture and Economic Growth: The Case of Iran

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***Abstract*- An autoregressive Distributed Lag (ARDL) cointegration framework during 1970-2009 is used to examine the short-run and long-run role of agricultural value added in economic growth of Iran. Results show that the empirical evidence strongly suggests that agriculture makes a significant contribution to economic growth in the long-run. The long-run and short-run elasticities of agricultural value added are estimated to be 0.27 and 0.39 respectively. A statistically significant error correction term implies that long-run causality exists such that past equilibrium errors play a significant role in determining current outcomes. The adjustment parameter is 0.78 which implies that around 0.78 of growth adjustment taking place in any year, in other words around 99% of the growth adjustment occurring after three periods. Also, performing multivariate Granger causality tests based on the ARDL-ECM estimates show that, agriculture cause real GDP per capita in the both short-run and long-run, but real GDP per capita cause agriculture only in the short-run.**

Keywords*- *Agriculture; Economic Growth; ARDL; Iran

I. INTRODUCTION

The linkage of agriculture and economic growth has received substantial attention by both agriculture and economic growth economists. Long before [1] identified what are today considered the fundamental economic contributions of agriculture to development, economists focused on how agriculture could best contribute to overall growth and modernization. The canonical model was suggest by [2] and subsequently extended by [3]. Lewis 'model rests on the idea of surplus labor existing in the agricultural sector. [4] Mentioned the importance of food supply in the agricultural sector. This early view on the role of agriculture in economics also matched the empirical observation made by [5] that the importance of the agricultural sector declines with economic development.

Growth and higher productivity in the agricultural sector can contribute to overall economic growth by releasing labor as well as capital to other sectors in the economy. [6], [7] or [8] have seen industrialization as the ultimate driving force behind a country's development and agriculture as a traditional, low productivity sector.

Improving on the Lewis model, [9] account explicitly for agriculture as an active sector in the economy. In addition to labor and food supply, agriculture plays an active role in economic growth through important production and consumption linkages. On the consumption side, a higher productivity in agriculture can increase the income of the rural population, thereby creating demand for domestically produced industrial output. Moreover, agricultural goods can be exported to earn foreign exchange in order to import capital goods. The importance of such linkages was further stressed by [10] and explicitly embodied in Adelman's general equilibrium idea of agricultural demand led industrialization (ADLI), according to which, because of production and consumption linkages, a country's development strategy should be agriculture-driven rather than export-driven and increased agricultural productivity would be the initiator of industrialization [11].

[12], pointed out the large share of agriculture in many developing economies do not immediately imply that overall growth has to be based on an ADLI-type strategy. [13] Suggests that the relation between agricultural growth and overall economic growth depends on the openness of a country to international trade. Fei and Ranis (1961) acknowledged that imports could potentially substitute for domestic agricultural products. Adelman (1984) suggested that ADLI would work best for low-income countries that are not yet export-driven. And [14] stressed that the tradability of rural non-farm sector goods can have different implications. The 2008 World Development Report's message ([15]) suggests that in agriculture-based economies, agriculture can be the main engine of growth, whereas in transforming countries, agriculture is already less important as an economic activity but is still a major instrument to reduce rural poverty.

Of empirical investigation of the relation between the agricultural sector and economic growth, [5] and [16] focused on sector changes accompanying economic development. In 1966, [5] observed that as economies develop, the share of agriculture in output and employment diminishes, which later empirical data have reconfirmed. Other important early contributions include [16], who combined cross-section and time-series data over 1950 – 1970.

[17] used a panel of 65 developing countries over 1960 – 1985 to show a positive correlation between growth in agricultural GDP and its lagged values and non-agricultural GDP growth, Similarly, [18] established a positive relation between different measures of agricultural productivity and average growth of real GDP per capita over 1960–1995 for a cross-section of countries. However, on the basis of panel data from 52 developing countries during 1980-2001, [19]

concluded that agriculture does not seem to be a primary force behind growth in national GDP per capita.

Although these empirical investigations establish correlation between agriculture and GDP growth, they do not imply causation in either direction. The correlation observed could be spurious if both sectors have been growing independently from each other or as a result of a common third factor. As a result, studies that have argued a causal effect of agricultural growth on economic growth have been criticized. To address this issue of endogeneity in empirical work, [20] used Granger causality tests to establish that agricultural value added per worker has a positive effect on GDP per capita in developing countries. [21] Also employed panel data tools such as GMM and Granger causality tests to re-estimate the effect of agricultural growth on the overall growth rate.

An additional problem that arises with cross-country studies is that differences in country conditions do not allow for a general relationship between agricultural and aggregate economic growth. Factors such as openness to trade could alter the relation between agriculture and non-agriculture. Global markets can be a substitute for what [17] calls first-order effects of agricultural growth (because they provide international capital flows and food imports). Hence, the importance of linkages between the agricultural sector and the rest of the economy differs across countries. Thus; this current study uses a multivariate causality framework to examine the dynamic causal linkages between agriculture and economic growth in Iran using time series data during 1970-2009.

The rest of the paper will investigate the results of an empirical study, to examine the relationship between economic growth and the relevant variables, especially agriculture. Sections two and three will then proceed to discuss data collection and methodology for the empirical study. It will look at the possible problems that might occur throughout the analysis. The fourth section discusses the estimation results. It will look at the regressions that have been constructed with the data and what results obtain. Finally, the last section will draw the conclusions based on the results as well as combine them with literature to get a better idea of what is happening.

II. MODEL SPESIFICATION AND DATA

The aim of this paper is to analyse the long run relationship between agricultural and economic growth. To this end, according to the Solow-Swan neoclassical growth theory and following [23], [24], [25] and [26] it is derived the empirical equation as follows:

$$\ln Y_t = \alpha \ln K_t + \beta \ln L_t + \delta \ln A_t + \phi \ln X_t + \gamma \ln P_t + \varepsilon_t \qquad (1)$$

Where Y_t represents real GDP, while K_t , L_t , A_t , X_t and P_t represent real gross capital formation, labor force, agricultural value added, real export and inflation rate respectively. The long-run relationship between agriculture and economic growth will explain how agricultural value added increases economic growth. Many studies show that agriculture plays vital role in increasing economic growth.

The annual Iran's time series data are taken for 1971-2007 from the World Development Indicators (WDI) online database. All variables are employed with their natural logarithms from (except inflation rate) to reduce heteroskedasticity and to obtain the growth rate of the relevant variables by their differenced logarithms.

III. METHODOLOGY

We examine the short-run and long-run relationship among variable. So we will use the error correction models (ECMs) and the autoregressive Distributed Lag (ARDL) approach to cointegration that was proposed by [27].

In this study, it is investigated the long-run and causal relationship between economic growth, agricultural value added, real exports, labor force, gross capital formation and inflation in Iran. First of all, it is tested the long-run relationship among the variables by using the ARDL bounds testing approach of cointegration, then, the casual relationship by using the error-correction based causality models has provided.

A. *Autoregressive Distributed Lag (ARDL) Cointegration Analysis*

The ARDL bounds testing approach of cointegration is developed by Pesaran and Shin and Pesaran et al. The ARDL cointegration approach involves two steps for estimating long-run relationship. The first step is to investigate the existence of long-run relationship among all variables in the equation. The ARDL model for the standard log-linear functional specification is as follows:

$$\begin{aligned}\Delta Y_t &= \theta_0 + \sum_{i=1}^{p}\theta_{1i}\Delta Y_{t-i} + \sum_{i=0}^{p}\theta_{2i}\Delta K_{t-i} \\ &+ \sum_{i=0}^{p}\theta_{3i}\Delta L_{t-1} + \sum_{i=0}^{p}\theta_{4i}\Delta A_{t-i} + \sum_{i=0}^{p}\theta_{5i}\Delta X_{t-i} \\ &+ \sum_{i=0}^{p}\theta_{6i}\Delta P_{t-1} + \gamma_1 Y_{t-1} + \gamma_2 K_{t-1} + \gamma_3 L_{t-1} \\ &+ \gamma_4 A_{t-1} + \gamma_5 X_{t-1} + \gamma_6 P_{t-1} + \nu_{1t}\end{aligned} \qquad (2)$$

Where υ_{1t} and Δ are the white noise term and the first difference operator, respectively. An appropriate lag selection based on a criterion such as Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC). The bounds testing procedure is based on the joint F-statistic or Wald statistic that is tested the null of no cointegration, $H_0 : \gamma_r = 0$ against the alternative of $H_1 : \gamma_r \neq 0$, $r = 1,2,3,4,5,6$

Two sets of critical values that are reported in Pesaran et al. provide critical value bounds for all classifications of the regressors into purely I(1), purely I(0) or mut ually cointegrated. If the calculated F-statistics lies above the upper level of the band, the null is rejected, indicating cointegration. If the calculated F-statistics is below the upper critical value, we cannot reject the null hypothesis of no cointegration. Finally, if it lies between the bounds, a conclusive inference cannot be made without knowing the order of integration of the underlying regressors.

The second step is to estimate the following long-run and short-run models that are represented in Equations (3) and (4) if there is evidence of long-run relationships (cointegration) between these variables.

$$Y_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i} Y_{t-i} + \sum_{i=0}^{p} \beta_{2i} K_{t-i} + \sum_{i=0}^{p} \beta_{3i} L_{t-1} + \sum_{i=0}^{p} \beta_{4i} A_{t-i} + \sum_{i=0}^{p} \beta_{5i} X_{t-i} + \sum_{i=0}^{p} \beta_{6i} P_{t-1} + \upsilon_{2t} \quad (3)$$

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i} \Delta Y_{t-i} + \sum_{i=0}^{p} \alpha_{2i} \Delta K_{t-i} + \sum_{i=0}^{p} \alpha_{3i} \Delta L_{t-1} + \sum_{i=0}^{p} \theta_{4i} \Delta A_{t-i} + \sum_{i=0}^{p} \alpha_{5i} \Delta X_{t-i} + \sum_{i=0}^{p} \alpha_{6i} \Delta P_{t-1} + \psi ECM_{t-1} + \upsilon_{3t} \quad (4)$$

Where ψ is the coefficient of error correction term ECM, defined as:

$$ECM_t = Y_t - \beta_0 - \sum_{i=1}^{p} \beta_{1i} Y_{t-i} - \sum_{i=0}^{p} \beta_{2i} K_{t-i} - \sum_{i=0}^{p} \beta_{3i} L_{t-1} - \sum_{i=0}^{p} \beta_{4i} A_{t-i} - \sum_{i=0}^{p} \beta_{5i} X_{t-i} - \sum_{i=0}^{p} \beta_{6i} P_{t-1} \quad (5)$$

It shows how quickly variables converge to equilibrium and it should have a statistically significant with a negative sign.

B. Causality Analysis with Error Correction Model

Error correction model is applied to check the short-run relationship among the economic growth and other variables. The value of coefficient of ψ in Eq. (4) should be significant and negative that indicates how far we are from the long-run equilibrium that will show the short-run equilibrium among the variables.

ARDL cointegration method tests the existence of long-run relationships between economic growth, agricultural value added, real exports, labor force, gross capital formation and inflation. It does not indicate the direction of causality. We use the two steps procedure from the Engle and Granger model to examine the causal relationship only between economic growth and agricultural value added. Once estimating the long-run model in Eq. (3) in order to obtain the estimated residuals, the next step is to estimate error-correction based Granger causality models. As opposed to the conventional Granger causality method, the error correction based causality test allows for the inclusion of the lagged error-correction term derived from the cointegration equation. Thus, the following models may employ to explore the causal relationships between the variables:

$$\begin{bmatrix} \Delta Y_t \\ \Delta A_t \\ \Delta K_t \\ \Delta L_t \\ \Delta X_t \\ \Delta P_t \end{bmatrix} = \begin{bmatrix} \mu_1 \\ \mu_2 \\ \mu_3 \\ \mu_4 \\ \mu_5 \\ \mu_6 \end{bmatrix} + \begin{bmatrix} \pi_{11,1} & \pi_{12,1} & \cdots & \pi_{16,1} \\ \pi_{21,1} & \cdot & \cdots & \cdot \\ \cdot & \cdot & \cdots & \cdot \\ \cdot & \cdot & \cdots & \cdot \\ \cdot & \cdot & \cdots & \cdot \\ \pi_{61,1} & \cdot & \cdots & \pi_{66,1} \end{bmatrix} \begin{bmatrix} \Delta Y_{t-1} \\ \Delta A_{t-1} \\ \Delta K_{t-1} \\ \Delta L_{t-1} \\ \Delta X_{t-1} \\ \Delta P_{t-1} \end{bmatrix} + \ldots + \begin{bmatrix} \pi_{11,k} & \pi_{12,k} & \cdots & \pi_{16,k} \\ \pi_{21,k} & \cdot & \cdots & \cdot \\ \cdot & \cdot & \cdots & \cdot \\ \cdot & \cdot & \cdots & \cdot \\ \cdot & \cdot & \cdots & \cdot \\ \pi_{61,k} & \cdot & \cdots & \pi_{66,k} \end{bmatrix} \begin{bmatrix} \Delta Y_{t-k} \\ \Delta A_{t-k} \\ \Delta K_{t-k} \\ \Delta L_{t-k} \\ \Delta X_{t-k} \\ \Delta P_{t-k} \end{bmatrix} + \begin{bmatrix} \psi_1 \\ \psi_2 \\ \psi_3 \\ \psi_4 \\ \psi_5 \\ \psi_6 \end{bmatrix} ECM_{t-1} + \begin{bmatrix} \nu_{4t} \\ \nu_{5t} \\ \nu_{6t} \\ \nu_{7t} \\ \nu_{8t} \\ \nu_{9t} \end{bmatrix} \quad (6)$$

Residual terms, ν_{4t}, ν_{5t}, ν_{6t}, ν_{7t}, ν_{8t} and ν_{9t}, are independently and normally distributed with zero mean and constant variance. An appropriate lag selection is based on a criterion such as AIC and SBC.

IV. EMPIRICAL RESULTS

Firstly, univariate time series properties were examined using Augmented Dickey-Fuller (ADF) test. According to test results (Table 1) of each variable in the system, while most of the variables are I (1), labor force was I (0). The mixed data integration properties confirm that the ARDL cointegration technique is preferable to other conventional cointegration approaches (e.g., Johansen multivariate test).

TABLE I ADF UNIT ROOT TEST RESULTS

Order	Critical Value 95%	Adf	Variable
I (1)	-2/932	-3/545	DLn (y)
I (0)	-2/930	-3/486	Ln (l)
I (1)	-2/932	-5/775	DLn (p)
I (1)	-2/936	-4/767	Dln (x)
I (1)	-2/936	-7/690	Dln (a)
I (1)	-2/947	-9/997	Dln (k)

Then, it is estimated the bounds test in order to determine if a long-run relationship exist among the variables. Table II shows the empirical results for the ARDL bounds test for cointegration. Using the Akaike information criteria (AIC), the computed test statistic is larger than the critical Value upper bounds computed by [27], which implies that the null hypothesis of non-cointegration could be rejected at 5 or 10 percent significance level, so, the bounds F-test for Cointegration test yields evidence of a long-run relationship between economic growth, agricultural value added, real exports, labor force, gross capital formation and inflation. Table II, contains the estimated bound test and critical values.

TABLE II BOUND TEST RESULTS

Critical Value (1%)		Critical Value (5%)		Critical Value (10%)		Stat. F	Var.
I (1)	I (0)	I (1)	I (0)	I (1)	I (0)	43/4	DlnY
4/781	3/516	3/805	2/649	3/367	2/262		

Table III represents the estimated ARDL (1, 0, 0, 0, 0, 0) model that has passed several diagnostic

tests that indicate no evidence of serial correlation and heteroskedasticity.

TABLE III ESTIMATED LONGRUN COEFFICIENTS USING ARDLE

ARDL (1, 0, 0, 0, 0, 0) selected based on Schwarz Bayesian Criterion			
Regressors	Coefficient	Std. Error	T-Ratio [prop]
LNK	.28572	.023231	12.2992[.000]
LNL	.43051	.10359	4.1560[.000]
LNX	.12183	.013613	8.9495[.000]
LNP	-.5039E-3	.7034E-3	-.71649[.479]
LNA	.33882	.016834	20.1277[.000]
C	5.9077	.43264	13.6551[.000]
R-Squared .99472		R-Bar-Squared .99366	
S.E. of Regression .023436	F-stat.	F (6, 30) 941.8388[.000]	
DIAGNOSTIC TESTS			
Test Statistic	LM Version	F Version	
* A: Serial Correlation*CHSQ (1) = .025133[.874]*F(1, 29)= .019712[.889]*			
* D: Heteroskedasticity*CHSQ (1) = 1.1685[.280]*F(1, 35)= 1.1414[.293]*			

As shown in Table III, gross capital formation has a positive and statistically significant effect on economic growth. This result is consistent with stylized facts regarding the positive contribution of capital in the neoclassical theory of economic growth; It is well established in the development economics literature that capital formation is a key determinant of economic growth. However, while capital formation is necessary for economic growth, it is not a sufficient condition for growth. Also, the result agrees with the data on the recent experiences and economic conditions in Iran [28], [29], [30]. In recent years, the role of exports (or trade openness) in stimulating economic growth has been the subject of many empirical studies [31], [22]. Advocates of the export-led-growth hypothesis argue that the expansion of the export sector can be a catalyst for output growth via various channels Exports has a significantly positive effect on GDP growth. Comparing to the significant effect of capital formation and labor force on economic growth, the

Results indicate that inflation rate has not been an important determinant of long-run GDP growth.

While, inflation appears to have a negative impact on long-run growth in most nations, its effect is not statistically significant in case of Iran, this results can be due to the reactionary and short-term nature of macroeconomic policy interventions in Iran. Regarding to results, agriculture sector makes a significant contribution to aggregate economic growth in the long-run. The estimated parameter on agriculture is statistically significant at 1% significance level. Of greater interest in this study is the role of agriculture in promoting economic growth. Thus, this paper examines results for both long-run and short-run estimates of the impact of the agricultural sector on GDP growth in relatively greater detail.

With regards to the role of agriculture, results from Table III suggest that this sector makes a significant contribution to aggregate economic growth in the long-run. This result is consistent with [32] and [33].

In addition to the analysis of the long-run relationships discussed above, this study also explores causal relationship and short-run dynamics among the variables by using error-correction based Granger causality models which are weak (short-run) Granger causality and long-run Granger causality. Emphasis is only placed on the relationship between agricultural value added and real GDP. The results of both Granger causality models (see Tables IV, V) can be summarized as follows:

(i) All variables (except inflation) cause real GDP per capita in both of short-run and long-run.

(ii) Results show that there is causal evidence from the real GDP to agriculture in the long-run and short-run.

(iii) In addition, capital formation, labor force and real export negatively cause agriculture in the long-run and short-run. Inflation causes agriculture in the long-run but not in the short-run.(see Table V)

TABLE IV ERROR CORRECTION MODEL REPRESENTATIONE

ARDL (1, 0, 0, 0, 0, 0) Selected Based on Schwarz Bayesian Criterion			
Regressors	Coefficient	Standard Error	T-Ratio [prob]
DLNK	.22499	.024521	9.1753[.000]
DLNL	.33899	.089532	3.7863[.001]
DLNX	.095935	.0090676	10.5799[.000]
DLNP	-.3968E-3	.5453E-3	-.72771[.472]

DLNA	.26680	.021711	12.2884[.000]
DC	4.6519	.56365	8.2532[.000]
ECM (-1)	-.78743	.057644	-13.6602[.000]

TABLE V ERROR CORRECTION MODEL REPRESENTATION

ARDL (2, 0, 0, 0, 0, 1) Selected Based on Schwarz Bayesian Criterion

Regressors	Coefficient	Standard Error	T-Ratio [Prob]
DLNA1	-.26163	.14755	-1.7732[.087]
DLNK	-.12379	.071395	-1.7339[.094]
DLNL	-.39637	.15898	-2.4931[.019]
DLNX	-.073371	.027504	-2.6676[.012]
DLNP	-.9179E-3	.8764E-3	-1.0474[.304]
DLNY	.80359	.24374	3.2969[.003]
DC	-3.7659	1.4257	-2.6414[.013]
ECM (-1)	-.20274	.073663	-2.7523[.010]

The results show stronger evidence of causal flow from agriculture to GDP growth and also evidences of the causal flow from GDP growth to agriculture. This finding may be rejected the hypothesis of so-called ‘Dutch Disease’ in Iran, where resources from the agricultural sector were siphoned to the industrial sector [34], [35].

The estimated ECM is also negative (-0.78) and statistically significant at 1% confidence level. ECM indicates that any deviation from the long-run equilibrium between variables is corrected about 78% for each period and takes about 3.1 periods to return the long-run equilibrium level. In addition, Fig. 1 presents the plot of cumulative sum (CUSUM) and cumulative sum of squares (CUSUMQ) test statistics that fall inside the critical bounds of stable over the period of 1970-2009. The empirical results of our study are mostly consistent with the work of [26].

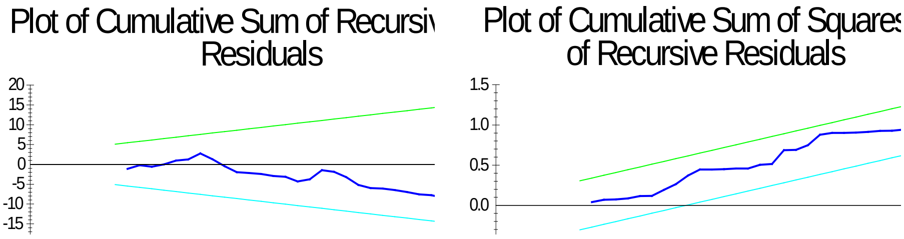

Fig. 1 Plot of cusum and cusumq test

V. CONCLUSION

Economic growth rises due to increase in agricultural value added, gross capital formation, labor force and real exports and decrease due to increase in inflation rate in case of Iran. Agricultural value added stimulates the economy in long-run through increase in aggregate demand. In this study it is examined that there is relationship between economic growth and in agricultural value added along with gross capital formation, labour force and real exports using the autoregressive distributed lag (ARDL) model.

Results indicate that the empirical evidence strongly suggests that agriculture makes a significant contribution to economic growth in the long-run. Furthermore, the result also shows evidences that real export (trade openness), labour force and capital formation have a positive impact on Economic growth, but, inflation rate effect on GDP, isn’t statistically significant. The long-run and short-run elasticities of agricultural value added are estimated to be 0.27 and 0.39 respectively. A statistically significant error correction term implies that long-run causality exists such that past equilibrium errors play a significant role in determining current outcomes. The adjustment parameter is 0.78 which implies that around 0.78 of growth adjustment taking place in any year, in other words around 99% of the growth adjustment occurring after three periods. Also, performing multivariate Granger causality tests based on the ARDL-ECM estimates show that, agriculture cause real GDP per capita in the both short-run and long-run, but real GDP per capita cause agriculture only in the short-run.

REFERENCES

[1] Johnston, B., Mellor, J., “The role of agriculture in economic development” American Economic Review 51(4): 566-593. 1961.

[2] Lewis, W. Arthur. 1954. Economic Development with Unlimited Supply of Labour, Manchester School of Economic and Social Studies 22 (2): 139 – 191.

[3] Ranis, Gustav and John C.H. Fei. 1961. A Theory of Economic Development, The American Economic Review 51 (4): 533 – 565.

[4] Schultz, Theodore William. 1964. Transforming Traditional Agriculture. New Haven: Yale University Press.

[5] Kuznets, Simon. 1966. Modern Economic Growth: Rate, Structure, and Spread. New Haven: Yale University Press.

[6] Cypher, James M, And James L. Dietz 2008. The Process of Economic Development, Oxon: Rutledge.

[7] Diao, Xinshen, Peter Hazell, Danielle Resnick and James Thurlow. 2006. The Role of Agriculture in Development: Implications for Sub-Saharan Africa. DSGD Discussion Paper No. 29, IFPRI, Washington D.C.

[8] Barrett, Christopher, Michael R. Carter and C, Peter Timmer. 2010. A Century-Long Perspective on Agricultural Development. American Journal of Agricultural Economics 92 (2): 447– 468.

[9] Johnston, Bruce F. And John W, Mellor 1961. The Role of Agriculture in Economic Development, the American Economic Review 51 (4): 566 – 593.

[10] Singer, Hans. 1979. ―Policy Implications of the Lima Target. Industry and Development: 17- 22.

[11] Adelman, Irma. 1984. ―Beyond Export-Led Growth. World Development 12 (9): 937 – 949.

[12] Gollin, Douglas. 2010. Agricultural Productivity and Economic Growth. In Handbook of Agricultural Economics Vol 4, Ed Robert Evenson and Prabhu Pingali, Amsterdam: North Holland.

[13] Matsuyama, Kiminori. 1002. ―Agricultural Productivity, Comparative Advantage, and Economic Growth. Journal of Economic Theory 58 (2): 317 – 334.

[14] Foster, Andrew and Mark Rosenzweig. 2003. Agricultural Development, Industrialization and Rural Inequality. Brown University and Harvard University: Mimeo.

[15] Wold Bank. 2007. World Development Report 2008: Agriculture for Development. Washington D.C. and Oxford: Oxford University Press.

[16] Chenery, Hollis and Moises Syrquin. 1975. Patterns of Development, 1950-1970. Oxford: Oxford University Press.

[17] Timmer, C. Peter. 2002. Agriculture and Economic Development. In Handbook of Agricultural Economics, Vol 2A, Ed Bruce L Gardner and Gordon C, Rausser, Amsterdam: North Holland.

[18] Self, Sharmistha and Richard Grabowski, 2007, Economic Development and the Role of Agricultural Technology, Agricultural Economics 36 (3): 395 – 404.

[19] Gardner, Bruce. 2005. Causes of Rural Development. Agricultural Economics 32 (1): 21 – 41.

[20] Tiffin, Richard and Xavier Irz. 2006. Is Agriculture the Engine of Growth? Agricultural Economics 35 (1): 79 – 89.

[21] Bravo-Ortega, Claudio and Daniel Lederman. 2005. Agriculture and National Welfare around the World: Causality and International Heterogeneity since 1960, Policy Research Working Paper No. 3499, World Bank, Washington D.C.

[22] Awokuse, T. O., "Trade openness and economic growth: Is growth export-led or import-led?", Applied Economics 40: 161-173, 2008.

[23] Timmer, C. P., "Getting agriculture moving: do markets provide the right signals?" Food Policy 20(5): 455-472. 1995.

[24] Hwa, E.C., 1988. "The contribution of agriculture to economic growth: some empirical evidence." World Development 16(11): 1329-1339.

[25] Ruttan, V. "Technology, Growth and Development –An Induced Innovation Perspective", Oxford: Oxford University Press. 2000.

[26] Awokuse, T. O., "Does Agriculture Really Matter for Economic Growth in Developing Countries?", American Agricultural Economics Association Annual Meeting, Milwaukee, WI, 2009.

[27] Pesaran, M.H., Shin, Y., Smith, R., "Bounds testing approaches to the analysis of level relationships." Journal of Applied Econometrics 16: 289-326. 2001.

[28] Sedigheh Atrkar Roshan, "Export linkage to economic growth: evidence from Iran", International Journal of Development Issues, Vol. 6 Iss: 1, pp.38 – 49, 2007.

[29] Rasekh Erfane, Abedy fraiba, "The Study of Relationship between Agricultural Exports and Economic Growth & Development during 1355-1388. Quarterly Journal of economic Growth and Development Research"; 1(2):95-112, spring 2011.

[30] Karbasi Ali Reza, Piri Mahdi; "A Study in the Relationship between Openness and Economic Growth in Iran: Co-Integration Analysis", Knowledge and Development, 16(27):145-160, summer 2009.

[31] Edwards, S., "Openness, trade liberalization, and growth in developing countries." Journal of Economic Literature 31: 1358-1393, 1993.

[32] Falsafian A., Ghahremanzadeh M, Gholami L.; Investigating Causality Between Agriculture and Economic Growth in Iran, Journal of Crop and Weed Ecophysiology(Journal Agricultural science), 4(14):91-101, summer 2010.

[33] Shah Abadi Abou Alfazl, "the Sources the Growth of Agricultural Sector in Iran", Roosta VA Towse'e, 12(4):125-Winter 2010.

[34] Okonkwo, I. C., "The erosion of agricultural exports in an oil economy: The case of Nigeria." Journal of Agricultural Economics 40(3): 375-84, 1989.

[35] Fardmanesh, M., "Dutch disease economics and the oil syndrome: An empirical study." World Development 19(6): 711-17, 1991.

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