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Abstract:

The aim of this paper is to study empirically the impact of agricultural raw materials imports on agricultural growth since it never done before. We have made this study in the context of three countries from North Africa (Tunisia, Morocco and Egypt) for the period 1965 – 2016. By using cointegration analysis and vector error correction model, empirical analysis proves that agricultural raw materials imports produce a positive effect on agricultural growth in the long run for all the three countries and cause agricultural growth in the short run in the case of Tunisia and Egypt. It is seen that agricultural raw materials imports are a source of economic growth in the agricultural sector. For this reason, countries of North Africa should adopt to integrate foreign technology imports and not technological innovation to stimulate agricultural sector.

JEL Classification: F11, F13, F14, F15, L66, O47, O55, Q16, Q17

Keywords: Agricultural Raw Materials Imports, Agricultural Growth, VECM, North Africa.

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I. Introduction

Generally, developing countries cannot produce the capital goods embodied in the technology they need. For developing countries, imports of capital goods and intermediate goods are essential inputs because these types of countries cannot produce these goods and because they are incorporated in the technology they need. And if there is not enough foreign exchange to finance imports of capital goods and intermediate goods, the economy cannot function properly, nor will growth be strong {see: Chenery and Bruno (1962), Mckinnon (1964) and Taylor (1991)}.

Amsden (1989) claimed that foreign technology imports are the most factors in explaining the rapid economic growth and suggested that a growth model suitable should integrate not technological innovation but foreign technology imports.

Grossman and helpman (1991), Barro and sala-I-Martin (1997), Benhabib and sepiegel (2002) and Griffith and al (2004) declare that the spreading of new technologies from developing economies to developing ones is considered as an essential driver of productivity growth for developing countries.

Benhabib and Sepiegel (2002), Griffith et al (2004), Cameron et al (2005) propose that countries overdue behind the technological frontier will experience faster productivity growth than the leading country and thus benefit from technological catch-up.

Bel Haj Hassine (2008) explored the role of human capital and trade openness in the process of technological diffusion and productivity growth in the Mediterranean agricultural sector. She found that human capital and trade openness facilitates technology diffusion and stimulates agricultural growth.

Margot Anderson (1989) argues that technology transfer helps to increase agricultural productivity, reduce production costs and lower consumer prices. Indicating that benefits depend on the way technology is transferred, the speed of transfer and the degree of influence of government policy on technology transfers.

De Janvry and Sadoulet (2001) have shown that technology in the agricultural sector can contribute to reducing poverty through direct effects (gain for adopters) and

indirect effects (lower food prices, job creation, effects related to agricultural investment and agricultural growth...,).

Furthermore, such an empirical exercise has never been done before in the context of North Africa and in the context of the impact of agricultural raw materials imports on Agricultural growth. In this research, we aim to span these wide opening by using function production include agricultural raw materials imports, agricultural exports and Gross Domestic Product in the agricultural sector; and which are estimated by applying co-integration analysis and vector error correction model for the period 1965 to 2016.

The rest of the paper is fixed as follows. Section 2 establish on a survey of literature. Section 3 explains the data characterization and methodological structure. Empirical results and analysis are engaged into account in next coming Section 4. Section 5 ends the study along with recommendations.

II. Literature Survey

The following table presents a set of empirical studies that are collected during our exploitation of this research theme to inspire the realization of our empirical analysis.

Table 1: Studies related to the nexus between imports / economic growth and between imports diversification and economic growth

No	Authors	Countries	Periods	Econometric Techniques	Keys Findings
			Imports and Economic Growth		
1	Hye (2012)	China	1978 – 2009	ARDL	M <=> Y : LR
				Granger Causality Tests	
2	Alavinasab (2013)	Iran	1961 – 2010	OLS	M => Y: (-)
3	Ahmed and al (2014)	Pakistan	1983 – 2013	Cointegration Analysis	M => Y
				Granger Causality Tests	
4	Albiman and Suleiman (2016)	Malaysia	1967 – 2010	Cointegration Analysis	M # Y
				VAR	
				Granger Causality Tests	
5	Riyath and Jahfer (2016)	Sri Lanka	1962 – 2015	Cointegration Analysis	M # Y : SR
				VECM	M => Y: LR
6	Bakari (2017)	Tunisia	1965 – 2016	Cointegration Analysis	M => Y : LR
				VECM	M # Y : SR
7	Bakari and Mabrouki (2017)	Panama	1980 – 2015	Cointegration Analysis	M => Y
				VAR	
				Granger Causality Tests	
8	Bakari and al (2018)	Nigeria	1981 – 2015	Cointegration Analysis	M # Y : LR
				VECM	M <=> Y : SR
9	Ofeh and Muandzevara (2017)	Cameroon	1980 – 2013	Correlation Analysis	M => Y: (-)
				OLS	M => Y : LR
			Imports diversification and economic growth		
10	Zhang and Zou (1995)	50 Developing Countries	1965 – 1988	Pooled OLS	FTM => Y
				Fixed Effect Model	
				Random Effect Model	
11	Ghosh (2009)	India	1970 – 2006	Cointegration Analysis	OM # Y : LR
				ARDL	
12	Jayaraman and Lau (2011)	5 countries	1982 – 2007	PFMOLS	OM => Y: LR (-)
				Panel Cointegration Analysis	
				Panel Granger Causality Tests	
13	Yazdani and Faaltofighi (2012)	5 countries	1980 – 2007	PFMOLS	OM <= Y
				PVECM	
14	Acheampong (2013)	Ghana	1967 – 2011	Cointegration Analysis	OM => Y: LR (-)
				ARDL	OM => Y: SR (-)
15	Bakari and Mabrouki (2018)	North Africa	1982 – 2016	Correlation Analysis	AM => Y
				Fixed Effect Model	
				Random Effect Model	
				Hausman Test	

Note : Y means Economic Growth, M means Imports, AM means Agricultural Imports, OM means Oil Imports, FTM means Foreign Technology Imports, LR means Long Run, SR means Short Run, (-) means Negative Effect.

III. Data, methodology and model specification

1) Data

To perambulate the impact of Agricultural raw materials imports on Agricultural GDP in North Africa, we will utilize a time series database that will spread the period 1965 - 2016, and taken from annual statistical reports of the World Bank. The short illustration of variables is specific as below in Table 2

Table 2: Description of variables

No	Variables	Description/Definition	Source
1	AY	Agricultural Gross Domestic Product (constant US $): agriculture corresponds to ISIC divisions 1-5 and includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The origin of value added is determined by the International Standard Industrial Classification (ISIC), revision 3 or 4.	The World Bank
2	AX	Agricultural Export (Constant US $): comprises the commodities in SITC sections 0 (food and live animals), 1 (beverages and tobacco), and 4 (animal and vegetable oils and fats) and SITC division 22 (oil seeds, oil nuts, and oil kernels), (constant US $)	The World Bank
3	AMM	Agricultural raw materials imports (constant US $): comprise SITC section 2 (crude materials except fuels) excluding divisions 22, 27 (crude fertilizers and minerals excluding coal, petroleum, and precious stones), and 28 (metalliferous ores and scrap).	The World Bank

2) Methodology

Methodologically, an estimate based on the development of VAR models introduced by Sims (1980) will be used to identify the nature of the temporal link between the main macroeconomic aggregates.

The first step includes determining the order of integration of each variable (If the variables are all stationary we can apply the model of Sims, and if not, we cannot apply it).

The second step is to determine the number of optimal delays included in our model to know the time needed (per year) for the independent variables to cause an effect (whether positive / negative) on the dependent variables.

The third step is to check the existence or the absence of a cointegration relation between the variables (if there is a cointegration relation we will apply the VECM Model, if there is not a cointegration relation we will apply the VAR Model).

3) Model specification

The augmented production function including Agricultural Gross Domestic Product, agricultural exports and Agricultural raw materials imports is expressed as:

$$\mathbf{AY = F(AX, AMM)} \quad \mathbf{(1)}$$

Where AY, AX and AMM depict respectively: gross domestic product in agricultural sector (Constant US $), agricultural export (Constant US $) and agricultural raw materials imports (Constant US $).

The Function can also be represented in log-linear econometric format thus:

$$\mathbf{Log\,(AY) = \beta_0 + \beta_1\, Log\,(AX)_t + \beta_2\, Log\,(AMM)_t + \varepsilon_t} \quad \mathbf{(2)}$$

Where:

- $\boldsymbol{\beta_0}$ is the constant term
- $\boldsymbol{\beta_1}$ is the coefficient of variable 'agricultural export'
- $\boldsymbol{\beta_2}$ is the coefficient of variable 'agricultural raw materials imports)
- **t** is the time rend (by year)
- $\boldsymbol{\varepsilon}$ is the random error term assumed to be normally, identically and independently distributed

IV. Empirical Analysis

As usual, the first step in performing estimation based on VAR model modeling is stationary analysis. There are several tests that determine the order of integration of each variable such as ADF, PP and KPSS. In our case, we will use the most adopted test which is the ADF test.

Table 3: Augmented Dickey Fuller Test

Variables	Egypt		Morocco		Tunisia	
	Constant	Constant, Linear Trend	Constant	Constant, Linear Trend	Constant	Constant, Linear Trend
AY	(1.463859)	(1.752586)	(0.791663)	(3.113750)	(1.102977)	(3.832720)**
	[8.315827]***	[8.545897]***	[14.51686]***	[14.35747]***	[5.082067]****	[5.527687]***
AX	(0.351095)	(1.479282)	(0.146829)	(2.781120)	(0.037970)	(2.014369)
	[6.767956]***	[6.919399]***	[7.428073]***	[7.418593]***	[9.768890]***	[9.907908]***
AMM	(2.170230)	(4.768593)***	(2.950329)	(2.773951)	(1.122097)	(3.832289)**
	[7.881689]***	[7.799699]***	[7.738695]***	[8.053752]***	[8.403844]***	[8.357375]***

*****;** and * denote significances at 1% ; 5% and 10% levels respectively**

( ) denotes stationarity in level

[ ] denotes stationarity in first difference

The results of the ADF test are described in Table 3. All the variables are stationary and especially they are stationary in first difference.

The second step in our empirical analysis is the cointegration analysis. In this case, we will apply the Johanson test which is most appropriate in checking the existence or absence of a cointegration relationship between the variables.

It should be noted that the results of the Lag Order Selection VAR indicate that the number of optimal delays is equal to 4 in the case of Egypt and 2 in the case of Tunisia and Morocco.

Table 4: Johanson Test

Unrestricted Cointegration Rank Test (Trace)				
Egypt				
Hypothesized No. of CE(s)	***Eigen Value***	***Trace Statistic***	***0.05 Critical Value***	***Prob.*****
None *	0.383183	47.42711	29.79707	0.0002
At most 1 *	0.319348	24.71754	15.49471	0.0016
At most 2 *	0.131686	6.636465	3.841466	0.0100
Trace test indicates 3 co-integrating equations at the 0.05 level				
Morocco				
Hypothesized No. of CE(s)	***Eigen Value***	***Trace Statistic***	***0.05 Critical Value***	***Prob.*****
None *	0.453713	57.56817	29.79707	0.0000
At most 1 *	0.317091	28.54688	15.49471	0.0003
At most 2 *	0.192113	10.23997	3.841466	0.0014
Trace test indicates 3 co-integrating equations at the 0.05 level				
Tunisia				
Hypothesized No. of CE(s)	***Eigen Value***	***Trace Statistic***	***0.05 Critical Value***	***Prob.*****
None *	0.460966	63.14962	29.79707	0.0000
At most 1 *	0.301816	33.48673	15.49471	0.0000
At most 2 *	0.287067	16.24162	3.841466	0.0001
Trace test indicates 3 co-integrating equations at the 0.05 level				
*** denotes rejection of the hypothesis at the 0.05 level**				
****MacKinnon-Haug-Michelis (1999) p-values**				

Johansen's test results indicate the existence of 3 cointegration relationships between the 3 variables in the 3 countries. Since all the variables are co integrated in the 3 countries, the vector error correction model will be retained. Among the virtues of applying an estimation based on the VECM model is the determination of the relationship between all variables in the long-term and the short-term.

The three long-term equilibrium relations in each country are presented as follows:

- ✓ **Egypt :**

  $$Log\ (AY) = 0.0276 + 0.0223\ Log\ (AX) + 0.0433\ Log\ (AMM)$$ **(3)**

- ✓ **Morocco :**

  $$Log\ (AY) = 0.0016 + 0.7642\ Log\ (AX) + 0.4078\ Log\ (AMM)$$ **(4)**

- ✓ **Tunisia :**

  $$Log\ (AY) = 0.0074 + 0.2827\ Log\ (AX) + 0.8669\ Log\ (AMM)$$ **(5)**

Equations (3), (4) and (5) indicate that in the long run agricultural machinery imports and agricultural exports have a positive effect on agricultural GDP in the three countries. To verify the credibility of its results we must test the significance of equations of long-term equilibrium.

Table 5: VECM Estimation

Independent Variables	AY	Dependent Variables	
		AX	AMM
Egypt			
AY	-	9.441692 (0.0510)**	6.312555 (0.1770)
AX	12.12238 (0.0165)***	-	2.829385 (0.5868)
AMM	8.462452 (0.0760)*	18.77716 (0.0009)***	-
Lagged ECT	[-0.660036]**	[19.60309]	[16.47573]
Morocco			
AY	-	8.711686 (0.0128)***	1.165515 (0.5584)
AX	4.040152 (0.1326)	-	25.61590 (0.0000)***
AMM	1.044576 (0.5932)	1.254831 (0.5340)	-
Lagged ECT	[-0.980779]***	[1.168880]	[0.442794]
Tunisia			
AY	-	0.051700 (0.9745)	11.81685 (0.0027)***
AX	11.62245 (0.0030)***	-	3.132892 (0.2088)
AMM	9.336255 (0.0094)***	5.322587 (0.0699)*	-
Lagged ECT	[-0.823725]***	[1.356063]	[0.582888]

Values in brackets are estimated t-statistics for each cointegration equation. All other values are asymptotic Granger causality F tests, values in parentheses are p-values.
*** ** ; ** and * denote significances at 1% , 5% and 10% levels respectively**

a- In the long run :

The results of the VECM model show that imports of agricultural machinery and agricultural exports have a positive effect on agricultural GDP in all countries. Otherwise, the VECM model shows that the agricultural GDP has no effect on agricultural imports and agricultural exports. Even agricultural imports have no effect on agricultural exports.

b- In the short run :

The following table summarizes the causal links between the different variables in each country in the short term.

Table 6: Causality links in the short run

Egypt	Morocco	Tunisia
AX <=> AY	AY => AX	AX => AY
AMM => AY	AX => AMM	AMM <=> AY
AMM => AX		AMM => AX

V. Conclusion

In this article, we examined the effect of agricultural material imports on economic growth in the agricultural sector in Tunisia, Morocco and Egypt. In use three time series databases that cover the period 1965 - 2016 and that have been estimated by the Co-integration analysis and the error correction vector model. Empirical results show agricultural exports, imports of materials are co-integrated with economic growth positively in the long run. In all three countries, imports of agricultural materials have a positive influence on economic growth, and in its cointegration link, agricultural exports also have a positive effect on agricultural growth. This is explained by the transfer of technology included in imported agricultural materials that contribute to increase agricultural productivity, reduce production costs, and ensure food security and satisfaction with the level of consumption which leads indirectly, an increase in agricultural exports. All of these effects, whether direct or indirect, emphasize that imports of agricultural materials contribute to agricultural growth in the long run. On the other hand, the labor force in the agricultural sector in the three countries has a level of human capital that allows them to learn the use of imported materials technology and to use it in an efficient and more productive way. Which explains the positive effect of imports of agricultural materials on long-term agricultural growth in the case of Tunisia, Morocco and Egypt, and which also explains the positive effect of agricultural imports on agricultural growth in the case of Tunisia and Egypt. So the countries of North Africa must continue to pursue a growth model that adapts to integrate foreign technology imports and not technological innovation to have

agricultural investments characterized by huge productivity and rapid growth in the agricultural sector.

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