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The Effect of Trade Liberalization on the Sustainability of Agricultural Sectors in Egypt and Tunisia: A New Framework Based on TFP Growth Structure

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OUTLINE OF THE PRESENTATION

1. Introduction
2. Objectives
3. Methodology for TFP calculation
4. Results and discussions
5. Conclusions and implications

AGRICULTURE TFP GROWTH IN MENA: SETTING THE SCENE

- The overall growth performance of the MENA region over the period 1960–2000 has been both mixed and characterized by a higher degree of volatility compared to other regions in the world,
- Literature about Economic Growth Performances indicates that:
 - ❖ Capital is the less efficient factor,
 - ❖ Trade openness is less beneficial to growth,
 - ❖ Institutions are less efficient compared to the rest of the world,
 - ❖ The impact of adverse external shocks is more pronounced,
 - ❖ Stock of human capital is also modest due to the quality of education systems geared to the needs of the public sector

BACKGROUND

What about the growth of the agricultural sectors in MENA ? Does these shortcomings also apply for the agricultural sectors in the region ?

INTRODUCTION

- The growth of agricultural Total Factor Productivity (TFP) is considered fundamental to ensure food security and to enhance farmers' livelihoods in MENA.
- However, agricultural sectors in MENA countries are nowadays facing a lot of challenges.
 - ❖ Low levels of agricultural development,
 - ❖ Continuous population growth,
 - ❖ Diminishing supply of per capita natural resources (arable land and water),
 - ❖ Slowing returns to inputs intensification, etc.
- Further enhancement of agricultural productivity are crucial to overcome these problems,

INTRODUCTION

- However, only little studies have been examining the agricultural growth sustainability in these countries;
- Sustainability issue is actually highly important to investigate if we want to plan and design future development of agricultural sectors in these countries.
- Further, the effect of trade openness (among other factors) on agricultural productivity gains is also not clear,
- There is a need for deep analysis about Agricultural TFP, sustainability, and their determinants,

OBJECTIVES

- The main focus of this paper is to:
 - ❖ Quantify the TFP growth in Tunisia and Egypt (from 1961 to 2012),
 - ❖ Conclude about the sustainability of agricultural sectors in both countries based on TFP growth and trends,
 - ❖ Investigate some explicative variables, including trade liberalization, which are affecting the TFP growth .

OBJECTIVES

- Rationale behind choice of Tunisia and Egypt cases:
 - ❖ Agriculture in both countries is still considered as a main primary component of the economic growth as a whole (in difference with other MENA countries),
 - ❖ Irrigated / rainfed-dominated sectors,
 - ❖ Different orientations in terms of international trade,
- Thus, the comparison will be highly relevant,

METHODOLOGICAL FRAMEWOK

- In general, TFP growth is generated from two sources,
 - ❖ Technical efficiency, and
 - ❖ Technical change...
- The assessment of growth patterns could be defined as a trade-off between these two sources, which determines TFP growth.
- Growth can also be divided into:
 - ❖ Inputs use growth, and
 - ❖ Ouput growth

METHODOLOGICAL FRAMEWOK

- Employed methodology should allow us dividing the growth of the agricultural TFP in Tunisia and Egypt into its different sources:
 - ❖ MALMQUIST INDEX: calculate and divide the TFP into technical efficiency change, and technical change,
 - ❖ TORNQVIST INDEX: allow dividing the TFP growth into inputs use growth and output growth,

METHODOLOGICAL FRAMEWOK

- MALMQUIST INDEX : The TFP growth structure is defined as:

$$TFPS_t = \frac{TCh_t}{ECh_t}$$

Where:

$TFPS_t$ = Total Factor Productivity Growth Structure

TCh_t = Technical Change

ECh = Technical Efficiency Change

T = Time (1,T)

METHODOLOGICAL FRAMEWOK

- TORNQVIST INDEXES: used to construct both the aggregate output and input indexes (growth in TFP is considered as only equivalent to growth in technical change),
 - ❖ If the Malmquist calculation verify the hypothesis of no technical efficiency change , then Tornqvist can be used to divide the “technical change” into output and inputs changes,
 - ❖ The calculation of the Tornqvist indexes is as follows:



METHODOLOGICAL FRAMEWOK

Output index:
$$\ln \left(\frac{Q_t}{Q_{t-1}} \right) = 1/2 \sum_j (R_{j,t} + R_{j,t-1}) \ln \left(\frac{Q_{j,t}}{Q_{j,t-1}} \right)$$

Input index:
$$\ln \left(\frac{X_t}{X_{t-1}} \right) = 1/2 \sum_i (S_{i,t} + S_{i,t-1}) \ln \left(\frac{X_{i,t}}{X_{i,t-1}} \right)$$

TFP index:
$$\ln \left(\frac{TFP_t}{TFP_{t-1}} \right) = \ln \left(\frac{Q_t}{Q_{t-1}} \right) - \ln \left(\frac{X_t}{X_{t-1}} \right)$$

Where;

$R_{j,t}$ is the share of output (j) in total revenue in time (t),

$Q_{j,t}$ is the output (j) in time (t),

$S_{i,t}$ is the share of input (i) in total input cost, and

$X_{i,t}$ is the input (i) in time (t),

METHODOLOGICAL FRAMEWOK

- Finally: the TFP growth scores will be regressed on a set of variables for both Tunisia and Egypt:

$$\text{LnTFPG}_t = \alpha_0 + \alpha' Z_t (\text{BTD}_t, \text{IIC1}_t, \text{RR}_t, \text{TMC2}_t, \text{TO}_t, \text{INF}_t) + \varepsilon_t$$

LTFP =Total Factor Productivity in the Tunisian (Egyptian) agricultural sector;

α_0 : Coefficient

Z_t : Variable vector, including:

BTD (+) = Balanced territorial development indicators: Rural GDP per capita

IIC1 (+) = Index of Innovation Invention Capital- IIC - (Scientists-year)

RR (+) = Resources reallocation: Agricultural employment share (%)

TO (+) = Trade Openness: (Import + export)/total production (%)

INF (+) = Infrastructure: Road density (expressed in km/km² agricultural land)

RESULTS AND DISCUSSIONS

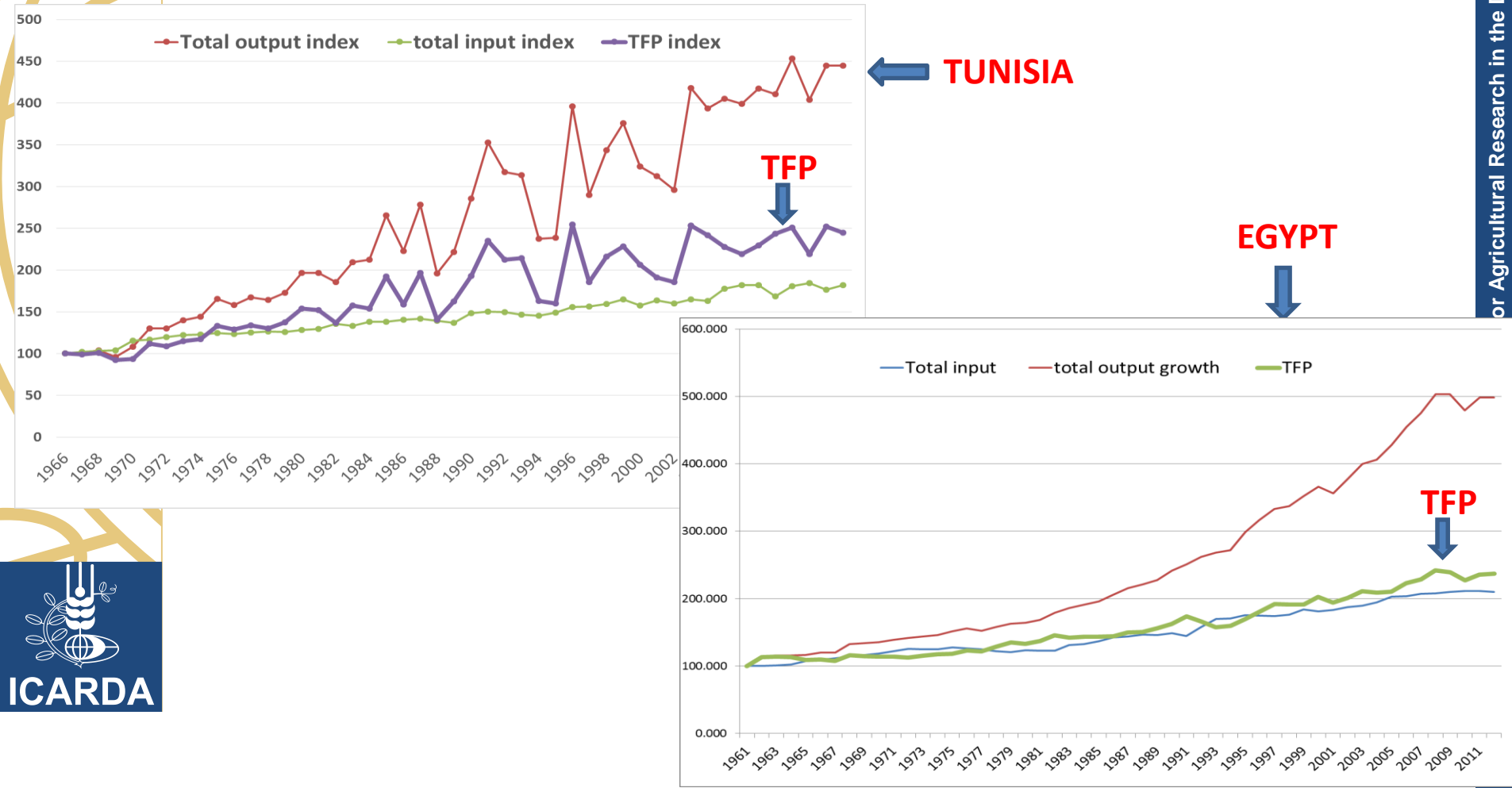
- Malmquist index: Source of TFP in Tunisia and Egypt:

The technical efficiency is neutral ... the only factor considered crucial for the explanation of the TFPG, in both countries, is the technological change.

Period	Indicators	Tunisia	Egypt
1962-1970	TCh	1.01	0.92
	ECh	1.00	1.00
	TFP	1.01	0.92
1976-1980	TCh	1.01	0.977
	ECh	1.00	1.00
	TFP	1.01	0.977
1991-1995	TCh	0.99	1.05
	ECh	1.00	1.00
	TFP	0.99	1.05
2006-2012	TCh	0.99	1.03
	ECh	1.00	1.00
	TFP	0.99	1.03

RESULTS AND DISCUSSIONS

- This finding allows us, in a second step, to proceed with the estimation of the Tornqvist index:



RESULTS AND DISCUSSIONS

- In more details: TFP Growth in Tunisia:

	Normalized Output Index	Normalized Input Index	Normalized TFP Index
1966	100	100	100
1970	107.70	115.31	93.41
1975	165.57	124.31	133.19
1980	196.64	128.06	153.56
1985	265.10	138.11	191.95
1990	285.15	148.02	192.65
1995	238.66	149.09	160.08
2000	324.07	157.18	206.18
2005	404.77	177.73	227.74
2010	403.90	184.40	219.04
2011	444.42	176.24	252.16

RESULTS AND DISCUSSIONS

- In more details: TFP Growth in Egypt:

	Normalized Output Index	Normalized Input Index	Normalized TFP Index
1962	100	100	100
1970	120.31	108.11	13.55
1975	144.37	125.07	19.29
1980	158.51	123.57	34.94
1985	184.17	129.21	54.95
1990	222.33	145.56	76.77
1995	270.29	163.66	106.63
2000	341.09	177.92	163.17
2005	393.48	191.52	201.96
2010	482.80	208.05	274.74
2011	498.16	211.21	286.95

RESULTS AND DISCUSSIONS

- No efficiency changes were detected in the Tunisian and Egyptian agricultural sector during the analysis period (1961-2012).
- Efficiency change makes reference to the improvement in farming efficiency which are purely due to enhanced farming skills and a better know how.
- This can be due to the fact that most of the farmers in both countries are not highly educated and are only managing small farms

RESULTS AND DISCUSSIONS

- the important fluctuation of the TFP in Tunisian agriculture compared to Egypt,
- This fluctuation in Tunisia is mainly due to the important fluctuation of the agricultural output index, which is also explained by the dominance of rainfed farming
- Focus should be made on improving the productivity of rainfed farming.

RESULTS AND DISCUSSIONS

- TFP Determinants for Tunisia :

Parameters	Dependent variable $\ln TFP_t$		
	Estimated coefficients	t-ratios	p-value
Constant	0.42	0.93	0.35
\underline{LBTD}_t (Balanced territorial development Indicators)	-0.63	-1.75	0.09
$\underline{LIIC1t}$ (Index of Innovation Invention Capital- IIC - # scientists-year)	-0.09	-0.50	0.61
\underline{LRR}_t (Resources reallocation: Agricultural employment share)	-2.66	-2.17	0.03
\underline{LTO}_t (Trade Openness)	0.80	3.46	0.00
\underline{LINE}_t (Infrastructure)	-0.01	-0.11	0.90
T	33		
R ²	0.45		
F-statistic	4.45 (p<0.0043)		
Log likelihood	21.99		

RESULTS AND DISCUSSIONS

- TFP Determinants for Egypt:

Parameters	Dependent variable $LnTFP_t$		
	Estimated coefficients	t-ratios	p-value
Constant	-0.12	-0.17	0.86
$LBTD_t$ (Balanced territorial development Indicators)	-0.07	-1.35	0.18
$LIIC1_t$ (Index of Innovation Invention Capital- IIC - # scientists-year)	0.09	0.36	0.71
LRR_t (Resources reallocation: Agricultural employment share)	0.005	0.01	0.99
LTO_t (Trade Openness)	0.04	0.65	0.51
$LINE_t$ (Infrastructure)	-0.05	-1.60	0.12
T	33		
R ²	0.14		
F-statistic	0.81 (p<0.51)		
Log likelihood	66.65		

RESULTS AND DISCUSSIONS

- Rural development variables (in Tunisia) were significantly and negatively affecting the agricultural productivity in the country,
- Inverse relation between 'share of agricultural employment' and 'TFP' in Tunisia,
- This shows that the agricultural activity is still a marginalized activity which is linked to low levels of income and is a source of employment for low productive labor.

RESULTS AND DISCUSSIONS

- Significance of trade openness in explaining TFP growth in Tunisia,
- Enhanced agricultural trade agreements with the rest of the world is actually beneficial to the agricultural sector as a whole,
- However, this variable was not significant for the case of Egypt. Trade openness in Egypt had not significant effect on enhancing the agricultural productivity growth in this country.

CONCLUSIONS AND IMPLICATIONS

- TFP is context specific and its drivers are different from one country to another,
- Structural problem of farm sizes, and farmers' educations, labor productivity,
- This type of structural problems cannot be handled only in the framework of an agricultural development strategy,
- A need for a wider vision of integrated rural development where agriculture is developed in parallel/synergy with other economic sectors.

CONCLUSIONS AND IMPLICATIONS

- Trade openness is not always affecting the total factors productivity in agricultural sectors of MENA. Why ? ... Tunisian agricultural is more oriented toward exports compared to Egyptian agriculture (??)
- Even when trade openness is positively affecting TFP growth, more analysis should be undertaken to identify the distribution of the extra-revenues generated by this trade,
- Especially if we know that many foreign direct agricultural investments have been done in Tunisia during the last two centuries....

WAY FORWARD

- More specific analysis (at commodity level; e.g cereals, horticulture crops, etc.)
- More countries (WANA, African, etc...)
- Other Models – Indicators:
 - R&D and Productivity Model

$TFP = f(\text{CGIAR \& NARS technology, human capital})$

- Policy and Growth Model

(1) $\text{Output} = f(\text{CGIAR \& NARS, human capital, policy})$

(2) $\text{CGIAR diffusion} = f(\text{NARS, human capital, policy and resource quality})$

...these hands translate knowledge into practice; **As researchers** we should take care with the owners of the hands



Thank You
We Welcome Your Feedback?