Evaluation Relationship between Openness and Total Factor Productivity (TFP) in Selected Developing Countries

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INTRODUCTION

The term of total factor productivity (TFP) refers to how output would change if all the factor inputs were maintained constant. TFP is thus, a catch-all for those things that increase the joint efficiency of labor and capital. This concept was introduced by Tibergen (1942) (Christensen, Cummings and Jorgenson (1980)). Several economists (Denison (1962), Christensen, Cummings and Jorgenson (1980), Kim and Lau (1992), and Osaka (1996)) have since made international comparison of post-war patterns of aggregate economic growth. Their common underlying theme is that growth should be driven by efficiency gains rather by the rapid growth of factor inputs, which, are subject to diminishing returns. Rivera-Batiz and Romer (1991), Grossman and Helpman (1991), Barro and Sala-i-Matin (1995), Edwards (1998), Cameron, Proudman, and Redding, (1998) have found robust positive relationship between openness and productivity growth. Thus they consequences openness enable to absorb new technologies and result would be economic growth through spillover effect. Kim and Lau's (1992) results revealed that even with the inclusion of human capital in the aggregate production function, technical progress remains the most important source of growth for the G-5. Krugman (1994) made similar observations for the G-5 (except Japan). I.Haouas and M. Yagoubi (2005) find a significant impact of openness on productivity growth in the MENA countries and Anthony Enisan Akinlo (2005) find openness significant positive effect on TFP in The Sub-Saharan African Countries too[1].

This paper compares openness and TFP relationship in the tow groups' countries. Furthermore, we disaggregate the estimates into sub-periods concomitant (1960, 1965, 1970, 1975, 1980, 1985, and 1990). The rest of the paper is therefore organized as follows. Section 2 discusses the methodology and data. The Model Estimation and Results is presented in section 3 while Commentary of model estimation result and concluding remarks are the focus of Section 4 and 5.

METHODOLOGY AND DATA

Our methodology for calculating TFP follows recent work by Edward (1998).The estimating model takes the following forms: $LTFP_{it} = \alpha + \beta * LOPEN_{it} + £ * LHUMC_{it} + \Omega_{it}$

Where $LTFP_{it}$ =logarithm of Total Factor Productivity, $LOPEN_{it}$ = logaritm of Openness, $LHUMC_{it}$ =logarithm of Human Capital, i = Selected Oil Exporter Countries (SOEC) and Selected South East Asia Countries (SSEAC) and t=1960, 1965, 1970, 1975, 1980, 1985, 1990.we estimate separated model for oil exporter and south East Asia countries. We follow Barro and Lee (2000) data set on human capital, Aiyar, Shekhar S. and Feyrer, James (2002) data set on TFP. Openness is another data that use in this paper and that is base of Sachs &.Warner index. These data sets is set

[1] - In this connection, some of the economists study relation between TFP and openness. for more information please refer to page 8

of 4 countries for which there is information on TFP, human capital and openness every five years from 1965 to 1990, giving us up to six observations on each of the tow groups of countries. Table **1** shows the variables on which we will focus across countries for the years 1960 and 1990.

Table 1 Variable of TFP, openness & human capital across countries (1960 – 1990)

Variable	country	1960	1965	1970	1975	1980	1985	1990
Open	Iran	78.44	76.63	83.77	136.81	58.88	53.3	60.25
Open	Algeria	221.97	78.52	96.45	119	87.76	84.14	64.61
Open	Venezuela	79.78	79.71	74.25	58.76	49.11	46.16	44.77
Open	Nigeria	37.09	52.19	63.53	100.03	128.38	79.16	55.21
Tfp	Iran	1.42	1.64	2.14	1.5	0.88	1.04	0.75
Tfp	Algeria	0.72	0.79	0.86	0.86	0.85	0.9	0.95
Tfp	Venezuela	1.05	1.5	1.85	1.26	0.9	0.85	0.72
Tfp	Nigeria	0.17	0.21	0.27	0.16	0.18	0.15	0.15
Hum	Iran	0.63	0.84	1.00	1.49	1.93	2.67	3.36
Hum	Algeria	0.97	0.65	0.82	1.08	1.55	2.14	3.01
Hum	Venezuela	2.53	2.47	2.92	3.38	4.93	5.30	4.89
Hum	Nigeria	0.28	0.27	0.30	0.46	0.55	0.67	0.82
Open	Thailand	31.35	37.61	42.8	38.91	45.19	42.81	70.17
Open	Malaysia	85.49	74.6	76.88	71.49	84.81	89.03	127.04
Open	Indonesia	39.28	37.45	41.97	58.21	58.59	42.33	40.81
Open	Korea, Rep.	5.05	6.05	14.94	23.9	35.24	35.16	43.01
Open	Singapore	341.83	208.14	218.05	171.61	229.82	220.87	301.31
Tfp	Thailand	0.22	0.26	0.31	0.30	0.38	0.36	0.52
Tfp	Malaysia	0.44	0.46	0.60	0.58	0.65	0.54	0.65
Tfp	Indonesia	0.27	0.25	0.26	0.25	0.26	0.30	0.30
Tfp	Korea, Rep.	0.32	0.31	0.44	0.46	0.44	0.49	0.71
Tfp	Singapore	0.4	0.45	0.72	0.9	1.08	1.02	1.33
Hum	Thailand	3.45	3.15	3.54	3.55	3.77	4.78	5.35
Hum	Malaysia	2.34	2.67	3.05	3.70	4.49	4.88	5.54
Hum	Indonesia	1.11	1.36	2.29	2.47	3.09	3.65	3.30
Hum	Korea, Rep.	3.23	4.43	4.76	5.77	6.81	8.03	9.25
Hum	Singapore	3.14	3.29	3.74	4.34	3.65	4.50	5.52

MODEL ESTIMATION AND RESULTS

This paper aims to directly estimate the importance of human capital and openness and thereby inducing total factor productivity. Our working hypothesis is that the rate of growth of a country's TFP is a Positive function of human capital and openness.

Our approach to estimate model is the cross- section data analysis bye the Eviews software. The results summarized in Table **2** and Table **3** demonstrate that is in agreement with economic theory and statistic criteria, i.e. human capital and openness have positive relationship with total factor productivity. But there are different elasticity between SOEC and SSEAC on the subject of relation of openness and human capital with total factor productivity .in the other hand, openness have more effect on TPF as compared with human capital in the SOEC, whereas human capital have more effect in the SSEAC.

Table 2 SOEC Estimation Result

Dependent Variable: @MEAN (LOG (T?))				
Method: Pooled Least Squares				
Date: 06/13/05 Time: 19:28				
Sample: 1 7				
Included observations: 7				
Total panel (balanced) observations 28				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-7.02329	1.419607	-4.94735	0
@MEAN (LOG (O?))	1.479122	0.328037	4.509008	0.0001
@MEAN (LOG (H?))	0.982986	0.081293	12.09182	0
R-squared	0.856486	Mean dependent var		-0.38675
Adjusted R-squared	0.845005	S.D. dependent var		0.793034
S.E. of regression	0.312213	Sum squared resid		2.436917
F-statistic	74.59979	Prob (F-statistic)		0

Table 3 SSEAC Estimation Result

Dependent Variable: @MEAN (LOG (TFP?))				
Method: Pooled Least Squares				
Date: 06/14/05 Time: 18:18				
Sample: 1 7				
Included observations: 7				
Total panel (balanced) observations 35				
Variable	**Coefficient**	**Std. Error**	**T-Statistic**	**Prob.**
C	-3.58402	0.30013	-11.9416	0
@MEAN (LOG (OPEN?))	0.39353	0.056306	6.989095	0
@MEAN (LOG (HUME?))	0.886136	0.096034	9.227322	0
R-squared	0.782	Mean dependent var	-0.96355	
Adjusted R-squared	0.76456	S.D. dependent var	0.281639	
S.E. of regression	0.136657	Sum squared resid	0.46688	
F-statistic	44.83956	Prob (F-statistic)	0	

COMMENTARY OF MODEL ESTIMATION RESULT

One percent increases in the openness (human capital) resulted **1.47(0.98)** percent increase on TFP in the SOEC. Furthermore one percent increase in the openness (human capital) resulted **0.4(0.88)** percent increase on TFP .so; oil exporter countries have good potential situation to increase total factor productivity by way of import intermediate and capital goods. Because, Openness to international markets, which helps facilitate technology spillovers, contributes to the growth of total factor productivity.

CONCLUSIONS

A recent literature has examined the impact of trade-related technology diffusion on productivity (TFP). That literature imposed symmetry between the impacts of openness and that of the R&D content of trade. This paper examines this issue. The main findings are as follows.

For North-North trade:

- The human capital content of trade has a greater impact on TFP than openness in the Selected Oil Exporter Countries (SOEC)
- Openness has a greater impact on TFP than the R&D content of trade in the Selected South East Asia Countries (SSEAC)

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