Theoretical and Applied Economics
Volume XXIV (2017), No. 1(610), Spring, pp. 233-246

Financial development, trade openness and economic growth in MENA countries: TYDL panel causality approach

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Abstract. *This paper examines the causal relationship between financial development (measured as Kaopen index and Line and Milesi-Ferreti index), trade openness and economic growth for 16 MENA countries within the panel co-integration techniques, panel VAR model and TYDL (Toda, Yamamoto, Dolado and Lutkepohl) Granger causality (1996), the empirical results show that both of finance-led growth and trade-led growth hypothesis seem to be rejected for the group as a whole. The results imply that financial development and trade liberalization do not seem to have made a significant impulse on economic growth for the period 1980-2014.*

Keywords: Financial development; Trade openness; Kaopen index; Milesi-Ferreti index; TYDL Granger causality.

JEL Classification: C33, E44, F10.

1. Introduction

In the last few years the most of developing countries have counted on liberalisation policies of both financial and trade systems to increase the economic growth, where trade sectors focuses on the barriers imposed on exchange goods between countries to reduce it, the financial sectors have considered as a policy of measure trying to transform the financial system by reducing costs and the inefficiency in the production processes then increase the economic growth.

The link between financial and economic development in the last twenty years has concluded to many and mixed results, for example, from King and Levine (1993) study ; the results suggested a significantly impact of financial development on economic growth, the same result had founded by Christopoulos and Tsionas (2004) and Livine et al. (2000); a few other studies had founded a negligible impact from financial development to economic growth as Andersen and Tarp (2003), Levine (2005) and Ang (2008a), Khan and Senhadji (2003) paper had concluded that financial development affects the economic growth by a very small manner, and they supposed that the relationship between the two variables can be a non-linear relationship, However, Ang and Mackibbin (2007) study had concluded that there is a significantly impact from economic growth to financial development, Patrick (1966) declared that in the case of financial development leading to economic growth, it is named the supply-leading hypothesis, in other hand when the economic growth inducing financial development, it is named the demand-following hypothesis (Shun et al., 2013, pp. 294-301), but by returning to Robinson (1952) and Lucas (1988) we found that many economists argue that there is no relationship between financial and economic development.

Fratzscher and Bussiere (2004) from e working paper named "Financial openness and growth: short-run gain, long-run pain?" declared that economic growth immediately after liberalisation is often driven by an investment boom and a surge in portfolio and debt inflows, which then become detrimental to economic growth in the medium-run to long-run, so, such a trade-off may be created by an investment and lending boom immediately after liberalisation, which ultimately may turn into a bust and a collapse, resulting in lower growth and possibly recession and financial crises in the medium-run (Mackinnon and Pill, 1997 and 1999).

From the neoclassical growth models (Solow 1957 and others) technological change is exogenous-unaffected a country’s openness to world trade, but Grossman and Helpman (1992) have declared that trade policy affects long-run growth through its impact on technological change, and they pointed out that intervention in trade could raise long-run growth if protection encourages investment in research-intensive sectors for countries with an international advantage in this kind of goods (Harrison, 1996:pp. 419-447), the link between trade openness and economic growth has long been a big concern for all the countries around the world since the General Agreement on Tariffs and Trade (GATT) was signed in 1947, the WTO (World Trade Organization) is aimed to improve the standard living people in all member countries by boosting productivity through greater competition.

The aim of this paper is to examine the links between financial openness, trade openness and economic growth for 16 MENA countries using panel data over the period 1980-2014 (Algeria, Bahrain, Egypt, Iran, Jordan, Kuwait, Lebanon, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Syria, Tunisia and Turkey).

2. Literature review

The relationship between financial openness, trade openness and economic growth has been the subject of various and many articles since Adam Smith and Ricardo traditional models explained that openness would promote specialization, in the literature, the financial openness has recognized as the most important variable that impacts the economic growth, many studies have concluded that there is a significant affect from financial development to economic growth as Goldsmith (1969), Mackinnon (1973) and Shaw (1973), Benhabib and Spiegel (2000) examine whether financial development affects economic growth solely through its contribution to growth in primitives or factor accumulation rates or whether its also a positive impact on total factor productivity growth, the results suggest that indicators of financial development are correlated with total factor productivity growth, and the results show also a sensitive to the inclusion of country fixed effect.

Al-Awad and Harb (2005), this paper investigates the linkages between financial development and economic growth in the middle east countries using methods of panel co-integration and Granger causality, the results indicate that in the long-run term financial development and economic growth may be related to some level, in the short-run term, the panel causality points to real economic growth as the force that drives changes in financial development while individual countries causality fail to give a clear evidence of the direction of causations. Hassan et al. (2007) provide new evidence on the role of financial development in accounting for economic growth, using an unbalanced panel regressions and variance decomposition to examine what proxy measures are most important in economic growth, the findings suggest that there is a strong linkages between financial development and economic growth in high income OECD countries, but no in South Asian and Sub-Saharan African regions.

Apergis et al. (2007) examine whether a long-run relationship between economic growth and financial development exists or not using panel co-integration techniques for a dynamic panel of 15 OECD countries and 50 non-OECD countries over the period 1975-2000, three different measures of financial development are used in this paper, the first one is the liquid liabilities of the financial system which is defined as currency plus demand and interest-bearing liabilities of bank and non-bank financial depth used, the second indicator is the bank credit is defined as credit by deposit money banks to the private sector divided by GDP, and the third one is the private sector credit measures as the value of credits by deposit money banks and other financial institutions to the private sector divided by GDP, the findings support the existence of a single co-integration relationship between the variables, Further, the evidence points to a bidirectional causality between financial deepening and economic growth.

Baltagi et al. (2009), this paper examines which of trade and financial openness can help explain the pace of financial development, using annual data from developing and industrialised countries utilizing a dynamic panel estimation techniques, the findings reveal that the marginal effects of trade (financial) openness are negatively related to the degree of financial (trade) openness, thus, the results provide the Rajan and Zingales hypothesis which stipulates that both types of openness are necessary for financial development to take place. Yokee-Kee and Habibullah (2011) from a panel data perspectives using the GMM techniques developed by Arrellano and Bover (1995) tried to examine the causality between financial development and economic growth in developing countries (from Africa, Asia, Europe and Western Hemisphere), the findings reveal that although there exist evidence supporting the other views including the demand-following as well as non-causal relation between the economic growth and the financial deepening, these supports are not as strong as the supply-leading hypothesis.

Hsueh et al. (2013) examine the causal relationship between financial development and economic growth among ten Asian countries surveyed during period 1980-2007, the findings suggest that the direction of causality between the two variables is sensitive to the financial development variables used, moreover, the results support the supply-leading hypothesis as many financial development variables lead economic growth in some of the ten Asian countries especially in China.

Wadad Saad (2014), the objective of this paper is to determine whether a relationship exists between financial development and economic growth in Lebanon during the period 1972-2012, the results reveal a positive relationship between the two variables in the short-run term accompanied by a bidirectional Granger causality. Rehman et al. (2015) investigate the relationship between financial development, trade openness and economic growth in the Saudi Arabia over the period 1971-2012, the results indicate that there is a long-run relationship between the three variables, and the Granger causality exhibits unidirectional causality running from the trade openness to the economic growth and from the economic growth to financial development.

3. Data and methodology

The present research work has carried out the causal relationship between financial openness, trade openness and economic growth in MENA countries, we are led to resort to panel data from 16 MENA countries over the period 1980-2014, our data are obtained from different sources:

3.1. Data

a. Financial openness: we use in this paper two different proxies from the empirical literature that suggested various indicators of financial development where we find three types of measures, the first one is the de jure measures based on AREAER (IMF's Annual Report on Exchange Arrangements and Exchange Restrictions) by converting qualitative informations in to a quantitative databases, most important indicator used de jure measures is the index developed by Chinn and Ito (2006) named henceforth

KAOPEN, and the second type is the facto measures that are the main alternative to the de jure measures, where it captures information on financial integration that is distinct from that contained in the de jure indicators, in this case researchers specifically interested in FDI (Foreign Direct Investment) flows, the third one is the is the hybrid indicators that are another alternative, one if the drawbacks is that information about financial globalization is only part of eGlobe (trade information accounts for 50% of the index components) (Dreher, 2006: pp. 1091-1110), however it does provide information that is distinct from others.

The Kaopen index is the first index in our paper, this index based on binary dummy variables reflecting the restrictions on external accounts, the Kaopen index components four variables (k1, k2, k3 and k4), where the k1 represents the information on the existence of multiple exchange rates, k2 and k3 are the information on the transactions in the current and capital account, and the k4 is the information of the requirement of the surrender of export proceeds, when the Kaopen index takes high values it means that the country is open to capital flows, the second measure is the ratio gived by Lane and Milesi-Ferreti (2006) based on panel data of 147 countries, it is calculated as the ratio of the sum of total external liabilities and total external assets to GPD, a high level of this proxy means more capital mobility in the economy.

b. Trade Openness: measured by the sum of total exports and total imports as a percentage of GDP at 2005 constant prices.

c. GDP: measured by GDP per capita.

3.2. Econometric methodology

a. Unit root tests: we use panel root tests to examine the degree of integration between the four variables, for this reason we use five different panel unit root tests (Levin, Lin and Chu (LLC); Im, Pesaran and Shin (IPS); Maddal and Wu (MW-ADF, MW-PP); Breitung (Br) and Hadri test (HD)) by utilizing the model of constant and deterministic trend.

***LLC test:** is the most widely used test depending on ADF (Augmented Dickey Fuller) based on equation (1):

$$Y_{i,t} = \alpha_i y_{i,t-1} + \beta_{i,t} y + \mu_{i,t} \ldots ; i = 1,\ldots, N ; t = 1,\ldots, T , \quad (1)$$

where $\beta_{i,t}$ is the deterministic component, $\mu_{i,t}$ is the stationary process.

The test assumes that residuals are independently and identically distributed with mean 0 and variance σ^2_u and $\alpha_i = \alpha$ for each value of i.

***IPS test:** Im et al. (2003); The IPS test is an extension of the LLC test that relaxes the homogeneous assumptions by allowing for heterogeneity in the autoregressive coefficients for all panel members, the test begin by specifying a separate ADF regression for each cross section:

$$\Delta y_{i,t} = a_i + \alpha_i y_{i,t-1} + \sum_{j=1}^{pi} \beta_{ij} \Delta y_{i,t-j} + \varepsilon_{i,t}; \quad I = 1,\ldots, N; \quad t = 1,\ldots, T, \quad (2)$$

where $y_{i,t}$ is the stand of each variable under consideration in the model, a_i is the individual fixed effect, $\varepsilon_{i,t}$ is the random variable (i and t) which is independent and normal distributed.

The null hypothesis is: H0: $\alpha_i = 0$, for all i.

The alternative hypothesis is: H1: $\alpha_i = 0$ for i = 1, 2,…, N1

and $\alpha_i < 0$, for I = N+1, N+2,…, N.

***Maddal and Wu test:** this test use the Fisher's (1932) results to drive tests that combine the p-value from individual unit root tests, we define Ω_i as the p-value from any individual unit root tests for cross section i, to get the equation (3):

$$Z = \frac{1}{\sqrt{N}} \sum_{i=1}^{N} \Phi^{-1}(\Omega_i) \; ; N(0,1), \tag{3}$$

where Φ^{-1} is the inverse of the standard normal cumulative distribution function.

***Breitung test:** The Breitung method differs from LLC in two distinct ways. First, only the autoregressive portion is removed when constructing the standardized proxies:

$$\Delta y_{i,t} = (\Delta y_{i,t} - \sum_{j=1}^{pi} \beta_{ij} \Delta y_{i,t-j}) / S_i \tag{4}$$

$$\Delta y_{i,t-1} = (\Delta y_{i,t-1} - \sum_{j=1}^{pi} \beta_{ij} \Delta y_{i,t-j}) / S_i, \tag{5}$$

where S_i are the estimated standard errors from estimating each ADF.

Second, the proxies are transformed and detrended:

$$\Delta y_{i,t}^{*} = \sqrt{\frac{(T-1)}{(T-t+1)}} \left(\Delta y_{i,t} - \frac{\Delta yi,t-j+\cdots+\Delta yi,t}{T-t}\right) \tag{6}$$

$$y_{i,t}^{*} = y_{i,t} - y_{i,1} - \frac{t-1}{T-1}(y_{i,T} - y_{i,1}) \tag{7}$$

***Hadri test:** this test is similar to the KPSS unit root (Kwiatkowski-Phillips-Schmidt-Shin) and has a null hypothesis of no unit root in any of the series in the panel, this test is based on the residuals from the individuals OLS regressions of $y_{i,t}$ on a constant, or on a constant and trend:

$$Z = \frac{\sqrt{N}\,(LM - \xi)}{\varphi}, \tag{8}$$

where ξ=1/6 and φ = 1/45 if the model only includes constant, the second case ξ=1/15 and φ= 11/6300 otherwise.

LM statistique allows for heteroskedasticity across i (LM1 with the associated heteroskedasticity assumption, LM2 is the heteroskedasticity consistent).

Table 1. *Panel unit root tests*

Test	Null hypothesis	Alternative hypothesis	Deterministic Component	Method for Autocorrelation Correction
LLC	There is a unit root	There is no unit root	None, F, T	Lags
Br	There is a unit root	There is no unit root	None, F, T	Lags
IPS	There is a unit root	Some cross sections without unit root	F, T	Lags
HD	There is no unit root	There is a unit root	F, T	Kernel
MW-ADF	There is a unit root	Some cross sections without UR	None, F, T	Lags
MW-PP	There is a unit root	Some cross sections without UR	None, F, T	Kernel

Source: Eviews9 user guides II, pp. 564-565.

b. Panel Co-integration: The first one who introduce the concept of spurious or nonsense correlations was Udne in 1926, but before the 1987 all economists were using the linear regressions on the non-stationary series, but this regressions as declared by the Nobel laureate Clive Granger and Paul Newbold are dangerous and could produce spurious regressions.

We use in this paper three different types of panel co-integration, Pedroni test (Engle-Granger based), Kao test (Engle-Granger based) and Fisher test (combined Johansen).

***Pedroni co-integration test:** this test is based on an examination of the residuals of a spurious regression using variables that integrate in first differences I(1) and the variables are co-integrated if and only if the residuals are stationary at their level I(0), by following equation (9):

$$y_{i,t} = \alpha_i + \delta_i\, t + \beta_{1i}\, x_{1i,t} + \beta_{2i}\, x_{2i,t} + \ldots + \beta_{Mi}\, x_{Mi,t} + e_{i,t} \qquad (9)$$

for: $t = 1,\ldots, T$; $i = 1,\ldots, N$; $m = 1,\ldots, M$.
Where: y and x are integrated variables of order one I(1) and α_i and δ_i are individual and trend effects.

***Kao co-integration test:** the same basic approach in Pedroni test is follows by Kao test but with specifies cross sections specific intercepts and homogeneous coefficients on the first stage regressors, Kao (1999) had used a bivariate model as follows:

$$y_{i,t} = \alpha_i + \beta_i\, x_{i,t} + e_{i,t}$$

$$y_{i,t} = y_{i,t-1} + \mu_{i,t} \qquad (10)$$

$$x_{i,t} = x_{i,t-1} + \varepsilon_{i,t}$$

for: $t = 1,\ldots,T$; $i = 1,\ldots,N$.

***Fisher co-integration test:** this test developed by Maddala and Wu (1999) is based on Fisher (1932) test that uses the results of the individual independent tests by combining the tests from each individual cross sections to get a test statistique for the full model, if Ω_i is the p-value from and individual co-integration test for cross section i, the null hypothesis for the full panel is:

$$-2 \sum_{i=1}^{N} \log(\Omega_i) \longrightarrow \chi^2\, 2N \qquad (11)$$

χ^2 is based on Mackinnon-Haug-Michelis (1999) p-value for Johansen co-integration trace and maximum eigenvalue tests.

c. Toda-Yamamoto Granger causality (1995): The most common way to test the direction of causality is Granger (1969), Sims (1972) and Gwekes (1983), Granger causality is conventionally conducted by estimating VAR models, but this model suffers of the non stationarity problem, and the problem here is how to confirm the co-integrating relationship and how to estimate the VAR model when the system is integrated, the drawback of Granger causality (1969) test is the specification bias and spurious regression, in 1987 Engel and Granger declared that if X and Y two non-stationary and co-integrated variables the standard Granger causality is invalid procedure.

Toda and Yamamoto (1995) and Dolado and Lutkepohl (1996) developed a new procedure of Granger causality based on an augmented VAR modeling by introducing a modified Wald tests (MWald) statistique, and it can be applied with all the integration series types I(0), I(1) and I(2) for both non co-integrated or co-integrated variables, the TYDL (Toda, Yamamoto, Dolado and Lutkepohl) procedure composes from four steps, the first step is to find the maximum order of integration between the variables d_{max} where is the higher order of integration, the second step is to determine the optimal lag order (K) of VAR model in levels as usually choosed by Akaike information criterion (AIC), Schwarz information criterion (SIC), Hannan-Quin information criterion (HQ), the final prediction error (FPE) and the sequential modified LR test statistique (LR), the third step is to estimate the VAR model (VAR($K+d_{max}$)) as follows:

$$KO_{it} = \alpha_{1it} + \sum_{i=1}^{h+d} \beta_{1it} KP_{it-i} + \sum_{j=1}^{l+d} y_{1it} FO_{it-j\ i} + \sum_{k=1}^{c+d} \Delta_{1it} TO_{it-k} + \sum_{W=1}^{V+d} \xi_{1it} GDP_{it-W} + \varepsilon_{1it}$$

$$FO_{it} = \alpha_{2it} + \sum_{j=1}^{l+d} y_{2it} FO_{it-j} + \sum_{i=1}^{h+d} \beta_{2it} KP_{it-i} + \sum_{k=1}^{c+d} \Delta_{2it} TO_{it-k} + + \sum_{W=1}^{V+d} \xi_{2it} GDP_{it-W} + \varepsilon_{2it}$$

$$TO_{it} = \alpha_{3it} + \sum_{k=1}^{c+d} \Delta_{3it} TO_{it-j} + \sum_{i=1}^{h+d} \beta_{3it} KP_{it-i} + \sum_{j=1}^{l+d} y_{3it} FO_{it-j} + + \sum_{W=1}^{V+d} \xi_{3it} GDP_{it-W} + \varepsilon_{3it}$$

$$GDP_{it} = \alpha_{4it} + \sum_{W=1}^{V+d} \xi_{4it} GDP_{it-W} + \sum_{k=1}^{c+d} \Delta_{4it} TO_{it-j} + \sum_{i=1}^{h+d} \beta_{4it} KP_{it-i} + \sum_{j=1}^{l+d} y_{4it} FO_{it-j} + \varepsilon_{4it}$$

Where d is the maximal order of integration order of the variables in the system, h, l, c and v are the optimal lag length of KP_{it}, FO_{it}, TO_{it} and GDP_{it}, ε_{1it}, ε_{2it}, ε_{3it} and ε_{4it} are error terms and are assumed to be white noise with zero mean constant variance and no autocorrelation.

KO: is the Kaopen index for the financial openness.

FO: is the Lane and Milesi-Ferreti index for the financial openness.

TO: is the trade openness index.

GDP: is the GDP per capita.

Finally, the TYDL procedure uses the MWald test statistique to test the causal relationships between the variables.

4. Empirical results

4.1. Unit root tests

To investigate the stationarity of the series used, we use the unit root tests on panel data (Levin, Lin and Chin (LLC); Breitung t-test (BRE); Im, Pesaran and Chin W-test (IPS); MW-ADF Fisher; MW-PP Fisher and Hadri test), the results of the tests are presented in Table 2:

Table 2. *Unit root test*

	Null: Unit root (assumes common unit root process)		Null: Unit root (assumes individual unit root process)			
variables	LLC	BRE	IPS	MW-ADF	MW-PP	HADRI Z-test
KO	-0.489 (0.312)	-1.158 (0.123)	-0.281 (0.389)	31.531 (0.294)	45.459 (0.019)	4.892 (0.000)
FO	0.174 (0.430)	-1.106 (0.134)	-1.131 (0.128)	40.532 (0.143)	42.289 (0.105)	9.558 (0.000)
TO	1.150 (0.875)	2.063 (0.980)	-0.737 (0.230)	43.228 (0.088)	48.333 (0.320)	5.751 (0.000)
GDP	2.153 (0.984)	6.929 (1.000)	2.694 (0.996)	16.634 (0.988)	9.300 (1.000)	8.450 (0.000)
D(KO)	-4.908 (0.000)	-6.364 (0.000)	-6.702 (0.000)	98.402 (0.000)	708.72 (0.000)	5.553 (0.000)
D(FO)	-7.785 (0.000)	-4.805 (0.000)	-8.904 (0.000)	134.229 (0.000)	288.196 (0.000)	-2.555 (0.994)
D(TO)	-3.600 (0.000)	0.735 (0.768)	-6.781 (0.000)	118.024 (0.000)	218.012 (0.000)	4.701 (0.000)
D(GDP)	3.780 (0.999)	6.485 (1.000)	-3.845 (0.000)	84.220 (0.000)	165.193 (0.000)	6.004 (0.000)

Source: Author computation using Eviews9.

It can be inferred from the Table 2 that the unit root hypothesis cannot be rejected when the variables are taken in levels. However, when the first differences are used, the hypothesis of unit root non-stationary is rejected. These results enable to test the cointegration among variables in I(1) level.

4.2. Co-integration test

The drawback of the previously mentioned (Johansen 1991, Engle and Granger 1987) co-integration tests is their failure to consider information across countries, recently developed techniques allow us to deal with non-stationary data in a heterogeneous panel, which yield substantial benefits by exploiting data from a cross-section, we are able to examine the cointegration between the four variables by using Pedroni, Kao and fisher tests.

Table 3. *Panel cointegration tests*

Pedroni co-integration test				
Alternative hypothesis: common AR coefs. (within-dimension)				
	Statistic	Prob.	W.Statistic	Prob.
Panel v-Statistic	1.049466	0.1470	-1.201395	0.8852
Panel rho-Statistic	1.669918	0.9525	0.992695	0.8396
Panel PP-Statistic	2.045159	0.9796	-2.528337	0.0057
Panel ADF-Statistic	4.177478	1.0000	-2.159184	0.0154**
Alternative hypothesis: individual AR coefs. (between-dimension)				
Group rho-Statistic	1.865636	0.9690		

Pedroni co-integration test				
Alternative hypothesis: common AR coefs. (within-dimension)				
	Statistic	Prob.	W.Statistic	Prob.
Group PP-Statistic	-2.395516	0.0083**		
Group ADF-Statistic	-7.501756	0.0000**		
Kao co-integration test				
ADF	-2.074	0.0190**		
Fisher co-integration test				
Hypothesized	Fisher Stat.*		Fisher Stat.*	
No. of CE(s)	(trace test)	Prob.	(max-eigen test)	Prob.
None	129.8	0.0000**	116.5	0.0000**
At most 1	48.43	0.0096	49.47	0.0074**
At most 2	18.13	0.9228	19.21	0.8916
At most 3	19.56	0.8799	19.56	0.8799

Source: Authors computation using Eviews9.

From Table 3, the results inspired is that there is a conflict between the three tests, the Pedroni test shows that there is no co-integration between the variables (8 statistiques from 11), but the Kao test shows that there is a long-run relationship among the variables where the ADF statistique is -2.07 (Prob = 0.019 < 0.05), by passing to Fisher test we emphasize the Kao results, so, we conclude that there is a long-run relationship between the four variables in our study, Subsequently, we cannot apply the standard Granger causality (1969) and we must apply the TYDL Granger causality approach to avoid the spurious regression.

In the case of individual cross section results, we find that there is a co-integration relationship in 6 cross sections (Algeria, Iran, Lebanon, Syria, Morocco and Sudan), noting that in the case of Lebanon and Sudan the results show two vectors of co-integration.

Table 4. *Panel cointegration tests (individual cross section)*

Individual cross section results				
Cross Section	Trace Test Statistics	Prob.	Max-Eign Test Statistics	Prob.
Hypothesis of no cointegration				
Bahrain	36.2945	0.3817	20.3802	0.3154
Iran	50.5267	0.0274	29.3763	0.0291
Jordan	41.6386	0.1691	23.5074	0.1529
Kuwait	25.7984	0.8957	16.7591	0.6007
Lebanon	91.9038	0.0000	57.9448	0.0000
Qatar	40.7292	0.1974	27.2995	0.0543
Saudi Arabia	29.3168	0.8820	18.3256	0.6120
Syria	50.0906	0.0304	24.6047	0.1150
Egypt	50.3658	0.3265	27.3654	0.2012
Algeria	52.5287	0.0171	28.3024	0.0404
Mauritania	41.9156	0.1611	23.5846	0.1499
Morocco	44.1455	0.1070	27.8111	0.0468
Sudan	156.5376	0.0000	112.9975	0.0000
Tunisia	42.9543	0.1337	19.5465	0.3734
Tunisia	NA	0.5000	NA	0.5000
Turkey	46.5094	0.0665	24.8277	0.1083
Hypothesis of at most 1 cointegration relationship				
Bahrain	15.9142	0.7183	8.8020	0.8481
Iran	21.1505	0.3483	12.6445	0.4855
Jordan	18.1312	0.5564	16.1015	0.2190
Kuwait	9.0393	0.9911	8.1255	0.8958

Individual cross section results				
Cross Section	Trace Test Statistics	Prob.	Max-Eign Test Statistics	Prob.
Lebanon	33.9590	0.0157	24.7829	0.0146
Qatar	13.4297	0.8710	9.9616	0.7483
Saudi Arabia	22.5658	0.7982	19.2658	0.2200
Syria	25.4859	0.1448	17.5518	0.1475
Egypt	22.3255	0.1223	16.3259	0.2652
Algeria	24.2264	0.1910	17.1775	0.1638
Mauritania	18.3311	0.5417	12.3572	0.5128
Morocco	16.3344	0.6886	11.8120	0.5663
Sudan	43.5402	0.0007	34.7540	0.0004
Tunisia	23.4078	0.2266	15.6364	0.2468
Tunisia	31.7259	0.0296	16.7755	0.1828
Turkey	21.6817	0.3166	16.8059	0.1813

Source: Authors computation using Eviews9.

5. Toda Yamamoto Granger causality (TYDL)

The second step in testing for causality (after the determine of higher order of integration d_{max}) is to investigate the optimum lag length (K) chosen by AIC, LR, FPE, SC and HQ, where we must be caution when we select the lag length, because if the chosen lag length is less than true lag, the omission of relevant lags can cause bias, and if it is more than true lag, cause the estimate to be inefficient (Caporal and Pittis, 1999), Table 5 shows that the optimum lag length is 1 (k=1) out of maximum of 6 lags length as selected by AIC, FPE, SC and HQ.

Table 5. *Lag length selection*

Lag	LR	FPE	AIC	SC	HQ
0	NA	1.32e+09	32.35182	32.40388	32.37270
1	2917.586	35132.94*	21.81839*	22.07869*	21.92281*
2	27.16076*	35634.47	21.83249	22.30103	22.02044
3	23.48059	36595.17	21.85891	22.53569	22.13040
4	22.74465	37642.53	21.88679	22.77182	22.24182
5	23.45207	38569.69	21.91059	23.00386	22.34915
6	8.719528	41830.26	21.99096	23.29247	22.51305

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: Authors computation using Eviews9.

To verify the direction of causality between financial openness (Kaopen and Line and Milesi-Ferreti proxies), trade openness and economic growth using Toda Yamamoto (TYDL) causality test based on methodology estimated thought MWALD test, first we must estimate VAR(2) with d_{max} =1 and K=1, by estimating the following system equations:

$$= \begin{bmatrix} \alpha 1it \\ \alpha 2it \\ \alpha 3it \\ \alpha 3it \end{bmatrix} + \sum_{i=1}^{2} \begin{bmatrix} KOit-i \\ FOit-i \\ TOit-i \\ GDPit-i \end{bmatrix} \begin{bmatrix} \beta 1it & \gamma 1it & \Delta 1it & \xi 1\text{it} \\ \beta 2it & \gamma 2it & \Delta 2it & \xi 2\text{it} \\ \beta 3it & \gamma 3it & \Delta 3it & \xi 3\text{it} \\ \beta 4it & \gamma 4it & \Delta 4it & \xi 4\text{it} \end{bmatrix} + \begin{bmatrix} \varepsilon 1it \\ \varepsilon 2it \\ \varepsilon 3it \\ \varepsilon 4it \end{bmatrix} \begin{bmatrix} KOit \\ FOit \\ TOit \\ GDPit \end{bmatrix}$$

It's clear from Table 6 that there is no evidence for any causal relationship between all variables in any way, so we conclude that the variables are independent and both of financial openness and trade openness are useless and does not benefit the economic growth in MENA countries, these findings are approval the results of Robinson (1952) and Lucas (1988) and may other studies that suggest no relationship between financial development and economic growth, so both of supply-leading and demand-following hypothesis are rejected in MENA countries for the period 1980-2014 using both Kaopen index and Lane and Milesi-Ferreti index for measuring financial development.

Table 6. *TYDL Granger causality results*

Dependent variable: FO			
Excluded	Chi-sq	df	Prob.
GDP	0.063221	2	0.9689
KO	5.946246	2	0.0511
TO	5.233098	2	0.0731
All	8.205822	6	0.2234
Dependent variable: GDP			
Excluded	Chi-sq	df	Prob.
FIO	0.470725	2	0.7903
KO	2.118952	2	0.3466
TO	1.015777	2	0.6018
All	2.456943	6	0.8733
Dependent variable: KO			
Excluded	Chi-sq	df	Prob.
FIO	2.479198	2	0.2895
GDP	0.067295	2	0.9669
TO	4.823687	2	0.0896
All	5.871297	6	0.4378
Dependent variable: TO			
Excluded	Chi-sq	df	Prob.
FIO	1.661785	2	0.4357
GDP	1.494284	2	0.4737
KO	1.879131	2	0.3908
All	5.054144	6	0.5369

Source: Authors computation using Eviews9.

6. Conclusion

This paper examined the causal relationship between financial development measured by Kaopen index and Lane and Milesi-Ferreti index, trade openness measured by the sum of total exports and total imports as a percentage of GDP at 2005 constant prices and economic growth measured by GDP per capita for 16 MENA countries during the period 1980-2014 within a bivariate panel VAR model, TYDL Granger causality and the panel co-integration techniques, the empirical results indicate that out of 16 countries studied we find six co-integration relationships between the variables (Algeria, Iran, Lebanon, Syria, Morocco and Sudan), as for the full panel there is one vector of long-run

relationship between the variables. In addition, the results showed that both of supply-leading and demand-following hypothesis are rejected, so the hypothesis of finance-led growth and trade-led growth seem to be rejected for the MENA countries studied during the period 1980-2014, so despite all the liberalization efforts in international trade and financial development still very limited to impulse the economic growth in MENA countries as a group.

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Appendix

Table 7. *Descriptive statistics*

	FO	GDP	KO	TO
Mean	2.914132	7589.824	0.206451	0.533166
Median	1.412109	2790.240	-0.126347	0.531764
Maximum	34.15155	93352.02	2.389193	2.467072
Minimum	0.157283	256.5929	-1.894798	-0.001600
Std. Dev.	4.786887	12307.92	1.707981	0.423690
Skewness	3.705072	3.819108	0.192916	0.352434
Kurtosis	17.43311	21.43789	1.340129	2.808767
Jarque-Bera	5615.463	9028.092	67.63985	11.22382
Probability	0.000000	0.000000	0.000000	0.003654
Sum	1492.036	4128864.	115.4060	269.2488
Sum Sq. Dev.	11709.20	8.23E+10	1627.796	90.47472