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Economic Openness and Growth in MENA: Evidence from Dynamic Heterogenous Panel Models

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ABSTRACT

This paper explores the impact of openness on economic growth in MENA countries using a heterogeneous panel data approach over the period 1979-2019. We have found higher domestic capital stock and school enrollments to attribute to the region's economic growth. However, the empirical results support a weak indirect association between economic performance and openness of MENA countries using different globalization measures. Our findings support that MENA countries have limited economic growth gains from globalization.

ملخص

تستكشف هذه الورقة أثر الانفتاح على النمو الاقتصادي في بلدان الشرق الأوسط وشمال أفريقيا باستخدام نهج بيانات لوحة غير متجانسة خلال الفترة من 1979 إلى 2019. وقد وجدنا أن ارتفاع المخزون رأس المال المحلي والالتحاق بالمدارس يسهمان في النمو الاقتصادي للمنطقة. ومع ذلك، تدعم النتائج التجريبية وجود ارتباط ضعيف غير مباشر بين الأداء الاقتصادي وانفتاح بلدان الشرق الأوسط وشمال أفريقيا باستخدام مقاييس العولمة المختلفة. تؤيد نتائجنا أن دول الشرق الأوسط وشمال أفريقيا لديها مكاسب محدودة من النمو الاقتصادي من العولمة.

RÉSUMÉ

Cet article explore l'impact de l'ouverture sur la croissance économique dans les pays de la région MENA en utilisant une approche de données de panel hétérogènes sur la période 1979-2019. Nous avons constaté que l'augmentation

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du stock de capital domestique et des inscriptions à l'école contribue à la croissance économique de la région. Cependant, les résultats empiriques soutiennent une faible association indirecte entre la performance économique et l'ouverture des pays de la région MENA en utilisant différentes mesures de la mondialisation. Nos résultats confirment que les pays de la région MENA ont des gains de croissance économique limités grâce à la mondialisation.

Keywords: Openness, economic growth, cross-country growth regression, MENA, globalization

JEL Classification: C33, F02, F43, F62

1. Introduction

The relationship between economic openness and growth has been broadly discussed in the economics literature. However, these empirical and theoretical studies meet on common ground is hard to accept. On one side, the positive effect trade has on the economy is accepted by classical and neo-classical economists, yet some opponents claim inward-looking growth strategies to be superior, especially for developing countries. Nevertheless, although different opinions have arisen over time, the openness-growth relationship reached a consensus, arguing that real GDP per capita will consistently increase due to people seeking profits. Because profitability decreases as a result of competition, people will seek new products and technologies. This also means people will look for different trade venues or areas where they can do business. This main argument provides the basic principles within the consensus.

While the studies from Balassa (1978), Feder (1983), and Esfahani (1991) tested export-led growth assertions in particular, the focus in other research has shifted to openness and economic growth relations over time. Dollar (1992), Sachs & Warner (1995), Barro & Sala-i-Martin, (1997), and Rivera-Batiz & Romer, (1991) defended openness as having positive effects on economic growth through channels such as technological transfer, increased productivity, and effective resource use.

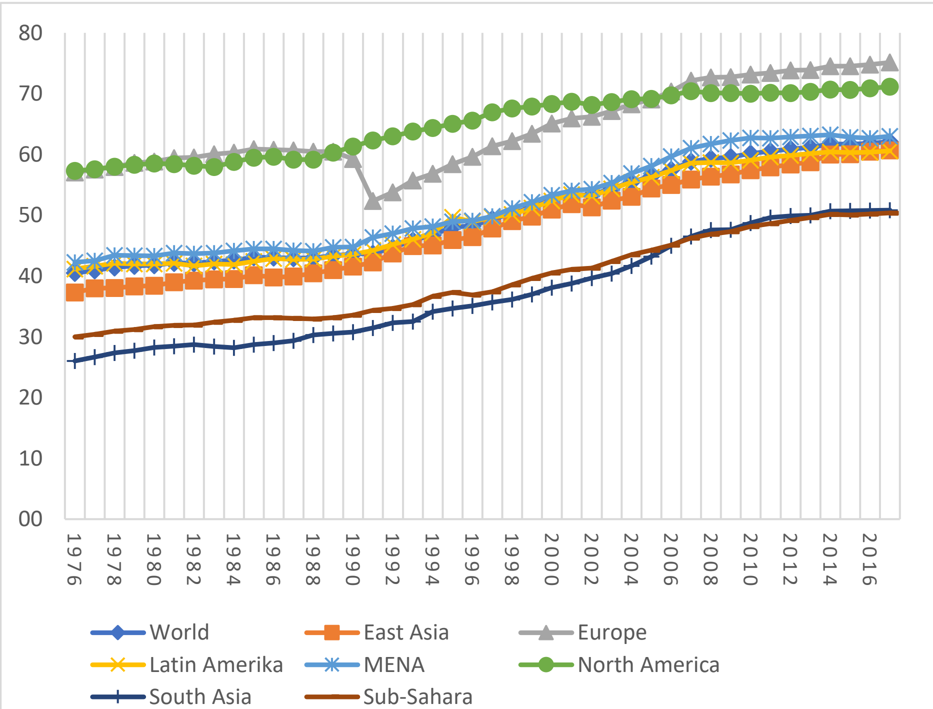
On the other side, Redding (1999), Young (1991), and Lucas (1988) asserted trade openness to slow down economic growth in the long run, contrary to expectations.

Empirical studies in the literature also have no common inference. Rodriguez and Rodrik's (2001) study put forth a new debate proposing no relationship to exist between trade openness and economic growth. Nevertheless, different results are still being obtained concerning studies' periodic and regional differences. While Ulasan (2015), Jalles (2012) and Musila and Yiheyis (2015) determined the relation between openness and economic growth to be insignificant and even negative, another research trend however argues increased trade openness to possibly be counterproductive to economic growth by increasing inflation and lowering exchange rates (Cooke, 2010; Jafari Samimi *et al.*, 2012). Trade openness can negatively impact economic growth for countries specialized in manufacturing low-quality products (Haussmann, Hwang, & Rodrik, 2007); Oskooee and Niroomand (1999), Chang *et al.*, (2009), Belazreg and Mtar (2019) and Darku and Yeboah (2018) arrived at positive conclusions claiming free trade to be one of the key drivers of economic development. Additionally, Omri *et al.* (2015) found economic growth and trade openness to be interrelated, claiming a bilateral relationship to exist between trade openness and economic growth. They stated the adoption of additional trade liberalization policies to support sustained long-term economic growth.

Meanwhile, some studies have claimed trade to enable developing countries' use of the technological facilities and knowledge available in developed countries. For instance, Abid (2019), and Mensi *et al.* (2018) claimed increased trade openness to stimulate technical progress for the selected industries; Ades and Glaeser (1999) and Hausmann (2001) showed the infrastructure of international transport infrastructure to be significant in increasing trade accessibility and supporting countries' economic growth. They also claimed landlocked countries to have decelerated economic growth due to being less exposed to the global economy.

When looking at the last decade, the economic performance of the Middle East and North African (MENA) countries has been very low and quite unlike other developing countries despite MENA's natural resources. This performance was observed to be partially due to political and social instability and wars and in particular to the cost of oil between 2008-2014, which led to improper policy choices. If sound macroeconomic and structural policies lead to reinforcing host economies' absorptive capacity, then foreign trade and investment will bring significant benefits from enhanced economic and sustainable growth to job creation and innovation. MENA economies and international organizations (*e.g.*, OECD, WTO, IMF) share many goals, including the need to undertake ambitious and coherent structural reforms to retain growth, create jobs and achieve more inclusive and sustainable development models. They also have a shared interest in fostering growth and economic openness. Yet when looking into the MENA region's integration with the outside world, a different story emerges than the path of growth. When looking at the data in Figure 1, the MENA region can be seen to have a higher globalization score than all regions apart from North America and Europe. While a course is observed in parallel with the world average, the values exceed this average after 2008. The main question of this study is how much influence the increasing interaction with the outside world has had on growth in the context of the above-mentioned theories. Has increased globalization had a positive effect on growth in this region as the theories claim?

Figure 1: Regional KOF globalisation index.



This study aims to contribute to the literature by re-examining the growth-openness nexus for the MENA region as a whole, which has had steadily increasing globalization but weak economic performance over the last decade. Secondly, while most studies have mainly focused only on the economic dimension of openness, the current study covers different dimensions of globalization such as cultural and political using different types of openness measures. Lastly, this study applies the augmented mean group (AMG) estimator in accordance with Eberhardt and Bond (2009) for estimating Mankiw et al.'s (1992) neoclassical growth model in the dynamic panel data for the MENA region. This estimator helps predict long-term interactions among the variables by taking long-term intervals without data loss and allows long-term coefficients that differ across groups (or countries) to be obtained. Moreover, it is an efficient estimator in non-stationarity cases and is robust in terms of cross-sectional dependence.

While the study has found higher domestic capital stock and school enrollments to attribute to the region's economic performance, the empirical results however support a weak association for the relationship between MENA countries' growth and openness. Because globalization policies can differ in terms of practice, we have place de facto and de jure measures for the composite globalization index to address this issue. The de jure index, which captures the policies related to global integration, has been found significant but very small, while the de facto index has been found insignificant. Our finding implies the economic growth gains from globalization to be very weak for MENA countries.

The structure of this article will proceed with Section 2 presenting the empirical model, estimation procedure, and data used in the analysis; Section 3 reporting and discussing the empirical results; and Section 6 being the conclusion.

2. Empirical Methodology

2.1. Empirical Model and Estimation Procedure

The neoclassical augmented growth model developed by Mankiw *et al.* (1992) has been implemented to analyze the relationship between openness and economic growth. The model incorporated with openness for performing the panel data analysis is:

$$\begin{aligned} log\, y_{i,t} &= \gamma_0 + (1+\gamma_1) log y_{i,t-1} \gamma_2\, log\big(p_{i,t} + t + \xi\big) + \gamma_3 log s_{i,t,K} + \gamma_4 log s_{i,t,H} \\ &+ \gamma_5 OP_{i,t} \\ &+ \varepsilon_{i,t} \end{aligned} \quad (1)$$

where y_i is the level of GDP per capita in country i and ($p_i + t + \xi$) indicates the sum of population growth rates, level of technological progress, and depreciation. $s_{i,K,}$ and $s_{i,H}$ denote the rates of physical and human capital accumulation for country i, respectively. Country i's degree of openness is represented by OPi. Lastly, $\varepsilon_{i,t}$ is the residual of the sum of time-constant country effect μ_i, a time-variant effect τ_t, and an idiosyncratic error term $v_{i,t}$ where $\varepsilon_{i,t} = \mu_i + \tau_t + v_{i,t}$.

Following Eberhardt and Bond (2009) and Eberhardt and Teal (2011), we have estimated the model using the augmented mean group (AMG) estimator, which takes into account the cross-sectional dependence and country-specific heterogeneity among the cross-section units in the macro panel data.[1] The model is given in the following equations:

$$y_{it} = \beta_i x_{it} + u_{it} \text{ where } u_{it} = \alpha_i + \lambda_i f_{t+} \varepsilon_{it} \quad (2)$$

$$x_{mit} = \pi_{mi} + \delta_{mi} g_{mt+} \rho_{1mi} f_{1mi} + \cdots + \rho_{nmi} f_{nmt} + v_{mit} \quad (3)$$

$$\text{where } m = 1, \ldots, k \text{ and } f_{mt} \subset f_t \text{ and } f_t = \varphi f_{t-1} + \varepsilon_t$$

$$\text{and } g_t = \kappa g_{t-1} + \varepsilon_t \quad (4)$$

where $i = 1, \ldots, N$ and $t = 1, \ldots T$, x_{it} is a vector of the observable variable, β_i is the country-specific slope parameter for the observed regressor, u_{it} includes unobservable factors, ε_{it} contains the error terms, α_i is the combination of group-specific fixed effects, f_t is the set of common factors, and λ_i are the factor loads specific to the cross-section units. λ_i, δ_i and ρ_i are the country-specific factor loads. In Eq. (4), f_t and g_t are common factors that cannot be observed and affect all cross-sections. This equation provides an empirical representation of the κ

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[1] Typical (micro) panel data have large cross-sections (*N*s) for short periods of time (*T*), whereas macro panel data have small *N*s for longer periods of time.

observable variables that are modeled of these common factors. Therefore, this model demonstrates the cross-section dependence in the observable and unobservable variables.

The estimate using the AMG estimator takes place in two steps (Eberhardt & Bond, 2009). The first step can be shown as:

$$\Delta y_{it} = b^{'} \Delta x_{it} + \sum_{t=2}^{T} c_t \Delta D_t + e_{it}$$
$$\Rightarrow \hat{c}_t \equiv \hat{\mu}_t^{\bullet} \qquad (5)$$

In the first stage shown in Eq. (5), the model is estimated using the first differences of the variables. The reason is that the non-stationary variables and non-observable factors are assumed to be correlated in the estimates in the regression model with the variables at this level. Thus, the year dummy coefficients indicated by $\hat{\mu}_t^{\bullet}$ are obtained.

In the second step, the estimated model is:

$$y_{it} = \alpha_i + b_i^{'} x_{it} + c_i t + d_i \hat{\mu}_t^{\bullet} + e_{it}$$
$$\hat{b}_{AMG} = N^{-1} \sum_i \hat{b}_i \qquad (6)$$

In the second step shown in Eq. (6), $\hat{\mu}_t^{\bullet}$ is included in the regression of each cross-section unit. A linear trend term is also included in the regression. AMG estimates are derived as the average of individual country estimates.

We have applied the following procedure to determine the difficulties in the macro panel data before estimating the AMG model. We first tested the cross-sectional dependency among cross-section units using the Breusch and Pagan (1980) Lagrange multiplier (LM) test and Pesaran's (2004) cross-sectional dependence test. Investigating the cross-sectional dependency among the series is mandatory to avoid biased estimates and spurious relations (Breusch & Pagan, 1980; Pesaran, 2004; Chudik & Pesaran, 2013). Next, we examined the stationarity properties of the series using the panel unit root tests. Then to prevent biased and misleading estimates that could arise from using non-stationary series and thus avoid spurious regressions, we employed panel cointegration tests to check for the long-term relationships among the series.

After identifying the long-term relationships among the variables, the long-term coefficients were finally estimated in the last step. Certain constraints should be taken into account in estimating the model. The possibility of slope parameter differentiations at the cross-section levels increase with larger time dimensions (*t*). In conventional pooled estimators, or more specifically, fixed- and random-effects estimators, the coefficients and error variances across groups are the same, but intercepts may vary across groups (Pesaran et al., 1999, pp. 621). The problem of being non-stationary is also possible with larger ts. If a correlation is found between the cross-section units, the preferred estimator should be robust in the cross-sectional dependence.

While the first-generation estimators such as the mean group estimator (MG; Pesaran & Smith, 1995; Pesaran et al., 1997) and the pooled mean group estimator (PMG; Pesaran et al., 1997) allow for heterogeneity of slope parameters in the panel time series analysis, they are not robust in cross-sectional dependence. For example, the idiosyncratic error terms must be serially uncorrelated for the GMM estimators to be valid. Moreover, GMM methodology does not allow for heterogeneous slope coefficients across units over time. When a cross-sectional dependency exists, correlations will be found in the variables and residuals due to general shocks or spillover effects. Cross-sectional dependence and slope heterogeneity in panel data may result in biased and inconsistent estimates, as well as in problems identifying relations (Comunale & Simola, 2016, p. 14). Eberhardt & Bond (2009) suggested heterogeneity, non-stationarity variables, and cross-sectional dependence to cause serious bias in standard panel estimators; various diagnostic tests have confirmed this claim.

The current study employs the estimator (AMG) method, a second-generation estimator, for accommodating the cross-sectional dependence and unit-specific heterogeneity among the countries' challenges that are present in the macro panel data for MENA.

2.2. Data

Data Table

	Data	*Source*
lngdpe	Real GDP per capita	The Penn World Table
openness	Total export and import; % GDP	The Penn World Table
lncn	log of Capital stock at constant 2011 national prices	The Penn World Table
lnlife	life expectation	The Penn World Table
KOFEcGI	KOF Globalization Index	KOF Swiss Economic Institute
KOFEcGI dj	de jure KOF Globalization Index	KOF Swiss Economic Institute
KOFEcGI df	De facto KOF Globalization Index	KOF Swiss Economic Institute
edu	Gross enrolment ratio, primary	The Penn World Table
fdi	Foreign direct investment %GDP	The Penn World Table

The data for estimating the model summarized above have been retrieved from the Penn World Tables (Feenstra et al., 2015). Real GDP per capita has been used for the variable yi,t,, the log of capital stock at constant 2011 national prices has been used for the variable si,K, and life expectation data have been used for the variable si,H. Just as Mankiw et al. (1992) have shown, this study also accepts the sum of the rates of depreciation and technological progress to be constant across the countries at 0.05%. Population growth rates have been calculated from the Penn World Tables data.

Openness indexes are wide composite indicators that combine different variables and approaches into one final index. As such, four different types of proxies have been applied here to the openness variable. The proportion of real export and import, as calculated in the Penn World Table, to GDP is accepted as the first indicator. Meanwhile, the study also utilizes the overall, de jure, and de facto types from the KOF Globalization Index that focus on economic globalization (Gygli et al., 2019).

The balanced panel data set involving the 13 MENA countries from 1979 to 2019 has been composed in the light of available data.[1] A large number

[1] These countries are Algeria, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Morocco, Qatar, Saudi Arabia, Tunisia, Turkey, and United Arab Emirates. Saudi Arabia, United Arab Emirates, and Iraq have been excluded due to lack of data in the models where education is used as a variable.

of countries with insufficient data due to the turmoil and civil wars in the region have been excluded from the analysis.

Correlation Probability	**OPENNESS**	**KOFECGIDJ**	**KOFECGIDF**	**KOFECGI**
OPENNESS	1.000000			

KOFECGIDJ	0.411444	1.000000		
	0.0000	-----		
KOFECGIDF	0.513996	0.866984	1.000000	
	0.0000	0.0000	-----	
KOFECGI	0.463070	0.984826	0.940256	1.000000
	0.0000	0.0000	0.0000	-----

3. Empirical Results

3.1. Testing Macro Panel Data

The results from the cross-sectional dependence and slope homogeneity tests are shown in Table 1, and the three tests indicate a strong correlation to exist between the cross-section units for the panel models. Also, the results from the slope homogeneity test are shown in Table 1 to reject the null hypothesis, thus confirming the presence of heterogeneity.

Table 1: Results from the Cross-Sectional Dependence and Slope Homogeneity Tests

	Cross-sectional dependence test			Slope homogeneity test	
	Breusch-Pagan LM	Pesaran CD Test	Pesaran scaled LM	Δ	Δadj
Panel I	438.429***	-0.821	50.08 ***	21807.73***	439.11***
Panel II	468.377***	0.710	48.94***	7370.19	860.015
Panel III	410.573***	4.326***	52.87 ***	17652.56***	503.998***
Panel IV	408.967***	2.505**	44.95***	83093.17***	224.271***
Panel V	473.705***	1.545	72.77 ***	22185.31***	439.876***

Note: ***, ** indicates significance at the 1% and %5 level; the null hypothesis of the cross-sectional dependence test has no cross-sectional dependence, and the null hypothesis of the slope homogeneity test has slope homogeneity.

Table 2 shows the results from the second-generation unit root test proposed by Pesaran (2007). The null hypothesis has been rejected for all variables. In other words, the first difference in the variables is stationary at a 1% level of significance (i.e., I (1).

Table 2: Results from the Cross-Sectional Dependence and Slope Homogeneity Tests

	Cross-sectional dependence test			Slope homogeneity test	
	Breusch-Pagan LM	Pesaran CD Test	Pesaran scaled LM	Δ	Δadj
Panel VI	746.479***	7.693***	22.44***	29.422***	31.985***
Panel VII	791.167***	8.569***	29.04***	27.679***	30.090***
Panel VIII	766.111***	11.747***	36.01***	27.416***	29.805***
Panel IX	704.988***	5.826***	32.85***	28.729***	31.232***
Panel X	539.960***	1.928**	196.9***	29049.70***	1698.76***

Note: ***, ** indicates significance at the 1% and %5 level; the null hypothesis of the cross-sectional dependence test has no cross-sectional dependence, and the null hypothesis of the slope homogeneity test has slope homogeneity.

Table 2: Results from the Pesaran CIPS Panel Unit Root Test

	Level	*First Difference*
Lngdpe	-1.024	-4.828***
Openness	-1.817	-5.662***
Lncn	-0.533	-2.358**
Lnlife	-0.685	-2.353**
KOFEcGI	-2.077	-5.443***
KOFEcGIdj	-2.03	-5.736***
KOFEcGIdf	-1.83	-5.276***
Edu	-1.494	-4.575***
fdi	-3.728***	

Note: *** denote statistical significance at the 1% and ** at the 5% level. The critical values for the model with intercept from Pesaran are -2.44 (1%), -2.25 (5%), and -2.14 (10%).

Step 3 investigates the presence of a long-term relationship among the variables using the panel LM co-integration test with multiple structural breaks as developed by Westerlund (2006) because it takes into account cross-sectional dependence and slope heterogeneity in estimating long-term cointegrated relationships among variables where traditional tests do not. Furthermore, breaking points stemming from the political developments and economic crises in MENA countries are predicted to occur over the long run.

Table 3: Results from the Westerlund Panel Cointegration Test

	LMstat	*p*-value[a]	*p*-value[b]
Panel I	-2.459	0.993	0.931
Panel II	-0.523	0.699	0.907
Panel III	-2.607	0.995	0.905
Panel IV	-0.590	0.722	0.805
Panel V	-2.050	0.980	0.954

[a] The *p*-value is based on the asymptotic normal distribution.
[b] The *p*-value is based on the bootstrapped distribution.
Trade openness, KOF overall economic globalization index, economic globalization, de facto and economic globalization, de jure and rate of FDI indices have been applied respectively as openness indicator in panel models VI, VII, VII, IX, and X .

The test's null hypothesis is that all units in the panel are cointegrated, while the alternative is that at least one country is found for which cointegration does not hold. The results in Table 3 show the null hypothesis to be acceptable for all four-panel models with respect to the bootstrap *p*-values. As a result, a long-term relationship is seen to occur among the variables in all models.

3.2. Growth Regression Results

Table 4: Results from the Westerlund Panel Cointegration Test

	LMstat	*p*-value[a]	*p*-value[b]
Panel VI	-1108.254	1.000	0.984
Panel VII	206.094	0.000	0.138
Panel VII	171.989	0.000	0.191
Panel IX	171.989	0.000	0.191
Panel X	0.066	0.474	0.933

[a] The *p*-value is based on the asymptotic normal distribution.
[b] The *p*-value is based on the bootstrapped distribution.
Trade openness, KOF overall economic globalization index, economic globalization, de facto and economic globalization, de jure and rate of FDI indices have been applied respectively as openness indicator in panel models VI, VII, VII, IX, and X .

The Results from the Augmented Mean Group (AMG) Estimator

	I	II	III	IV	V
openness	-0.154 (0.326)	0.0012 (0.006)	-0.007* (0.004)	0.006** (0.003)	-0.004 (0.024)
lnedu	0.002 (0.004)	0.007* (0.004)	0.009** (0.004)	0.003 (0.005)	0.006 (0.004)
lncn	0.534*** (0.064)	0.519*** (0.062)	0.490*** (0.053)	0.453*** (0.046)	0.509*** (0.051)
lnfixed	-0.099 (0.173)	0.053 (0.075)	-0.016 (0.046)	0.031 (0.063)	-0.060 (0.129)
_cons	-4.870*** (1.622)	-4.948*** (1.408)	-3.734*** (1.269)	-3.168** (1.238)	-4.497** (1.256)

Note: *** denote statistical significance at 1%, ** at 5%, and * at 10%. Trade openness, KOF overall economic globalization index, economic globalization, de facto and economic globalization, de jure and rate of FDI indices have been applied respectively as openness indicator in panel models I, II, III, IV, and V.

The empirical results for growth regression based on a novel AMG estimator are presented in Table 4. It shows higher domestic capital stock to lead to higher growth rates, as expected. Growth rates are higher with higher school enrollment, whereas the effect of life expectancy as another human capital measure has not been found to be significant.

We have found no significant effect from openness to have occurred on economic growth in MENA countries. Statistically significant coefficients have been obtained only when differentiating while implementing the *de jure* and *de facto* economic globalization indexes. However, the value of the coefficient is too small (nearly zero) to be considered seriously. Choosing different openness indexes results in different findings being obtained regarding the openness-economic growth nexus (Quinn *et al.*, 2011). Globalization indexes are composite indicators that combine various variables to measure different aspects of globalization (*e.g.*, economic, social, and political dimensions) into one final index. They are very useful but oversimplifying them may lead to globalization being misinterpreted.

To address this issue, we have placed the *de facto* and *de jure* measures from the KOF index to differentiate activities (output) and policies (inputs), as Martens *et al.* (2015) recommended. We have found the *de facto* index to result in a negative and statistically estimated coefficient when entered into the growth regression, whereas the *de jure* index, which measures variables representing policies, resources institutions enabling actual flow, and activities in countries, to be positive and statistically significant. The estimated values of the openness coefficients are very close to zero, which implies a weak association between openness and growth for MENA countries.

This finding implies a policy proposed on paper to be different in actual practice. In other words, integration into the global world on paper may be different than how it occurs in practice. For example, some countries have strict capital controls on paper but are toothless in practice (Kose *et al.*, 2009). This may explain why different signals have occurred regarding the relationship between globalization and economic growth.

The weak relationship between openness and growth supports the idea of growth benefits being indirectly achieved by opening an economy. The capital flows from industrial economies to developing countries simply cannot generate welfare gains and technology spillovers; they are unable to increase productivity and investment, and as a result, growth. Interactions among openness, education, and capital have been enabled in our model for analyzing the impact openness has on growth through human and physical capital.[6] All resulting coefficients are seen to be insignificant. However, having insignificant coefficients does not necessarily mean openness has no influence on human and physical capital in MENA countries. Opening an economy to the world probably leads to more investments; trade; technology transfer; and the spread of ideas, information, and reforms and as a result promote more productive capital.

In summary, our study finds MENA countries to have not benefitted from globalization, which is contrary to what the canonical theoretical models predict.

[6] These results are available upon request.

Table 5: The Results from the Augmented Mean Group (AMG) Estimator

	VI	VII	VII	IX	X
openness	-0.067 (0.075)	0.0012 (0.004)	-0.004 (0.005)	0.004** (0.002)	0.0005 (0.006)
lnlife	7.091 (5.699)	7.849 (5.169)	10.041 (6.266)	5.371 (5.399)	4.901 (4.943)
lncn	0.448*** (0.109)	0.435*** (0.113)	0.409*** (0.131)	0.436*** (0.112)	0.436*** (0.092)
lnfixed	-0.046 (0.085)	-0.004 (0.051)	-0.030 (0.065)	-0.003 (0.075)	0.056 (0.053)
_cons	-32.082 (22.283)	-34.954* (20.677)	-43.352* (24.618)	-24.736 (21.736)	-22.931 (18.825)

Note: *** denote statistical significance at 1%, ** at 5%, and * at 10%.
Trade openness, KOF overall economic globalization index, economic globalization, de facto and economic globalization, de jure and rate of FDI indices have been applied respectively as openness indicator in panel models VI, VII, VII, IX, and X .

4. Conclusion

The relationship between openness and economic growth has led to numerous debates in the literature for MENA countries between 1979 and 2019. Many studies in the literature have centered on various countries and used specific narrow measures for openness such as trade or trade liberalization scores range for estimating this relationship. Their empirical findings are ambiguous and vary over different countries and periods.

This study has estimated the next-generation augmented mean group estimation model using four different openness measures to test the long-term relationship between openness and economic activity. Our empirical results suggest no significant relationship to exist between openness and economic growth. The relationship the MENA region has with the external world may be concluded to not contribute to MENA's economic performance as natural resources-rich region. Having natural resources may eliminate incentives to develop other economic areas that are potentially more important for long-term economic growth.

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Appendix:

Panel unit root tests

In the panel unit root tests, the first-generation tests assume no correlation between the cross-section units. Therefore, in the case of a cross-section dependence, the first-generation tests are accepted as not providing reliable results. This study uses the unit root test proposed by Pesaran (2007), which takes cross-section dependence into consideration.

Pesaran's (2007) unit root test is one of the second-generation tests frequently used in the literature. For this test, Pesaran (2007, p. 265) developed a test "where the standard ADF regressions are augmented with the cross-section averages of lagged levels and first differences of the individual series." This test is called the cross-sectionally augmented Dickey-Fuller test (CADF). The simple average CADF statistics is a cross-sectionally augmented IPS test (CIPS; Pesaran, 2007, p. 267).

If residuals are not serially correlated, the cross-sectionally augmented DF (CADF) regression that is used for i^{th} country is as follows:

$$\Delta y_{it} = a_i + b_i y_{i,t-1} + c_i \bar{y}_{t-1} + d_i \Delta \bar{y}_t + e_{it} \tag{1}$$

where $\bar{y}_{t-1} = \left(1/N\right)\sum_{i=1}^{N} y_{i,t-1}$ and $\Delta\bar{y}_t = \left(1/N\right)\sum_{i=1}^{N} \Delta y_{i,t}$ (Hurlin & Mignon, 2007, p. 19). In order to test the unit root hypothesis, the *t*-ratio obtained from the OLS estimate of $b_i(\hat{b}_i)$ in the CADF regression (1) is used (Pesaran, 2007, p. 269). The *t* ratio $t_i(N,T)$ from the regression is as follows:

$$t_i(N,T) = \frac{\Delta y_i' \bar{M}_w y_{i,-1}}{\hat{\sigma}_i (y_{i,-1}' \bar{M}_w y_{i,-1})^{1/2}} \tag{2}$$

where

$$\Delta y_i = (\Delta y_{i1}, \Delta y_{i2}, ..., \Delta y_{iT})', y_{i,-1} = (y_{i0}, y_{i1}, ..., y_{i,T-1})'$$

$\bar{M}_w = I_T - \bar{W}(\bar{W}'\bar{W})^{-1}\bar{W}', \bar{W} = (\tau, \Delta\bar{y}, \bar{y}_{-1})$ and $\hat{\sigma}_i^2 = \frac{\Delta y_i' M_{i,w} \Delta y_i}{T-4}$ (Pesaran, 2007, pp. 270).

The Pesaran (2007, p. 276) CADF test is based on the individual CADF statistics. The average of the individual CADF statistic is the CIPS statistics, a modified version of the IPS test (Im et al., 2003). The CIPS statistic is as computed as follows:

$$CIPS(N,T) = t - bar = N^{-1}\sum_{i=1}^{N} t_i(N,T) \tag{3}$$

Pesaran (2007) presented the critical values for individual CADF distributions and critical values for the average of individual CADF distributions. The obtained CADF and/or CIPS statistics are then compared with the critical value in these tables. If the absolute value of the CADF and/or CIPS statistic is greater than the absolute value of the critical value, the unit root hypothesis is rejected. In this case, the series is accepted as being stationary.

Panel Cointegration Test

Finding a correlation between cross-section units affects which cointegration test gets selected. First-generation cointegration tests are considered to be unreliable in the case of cross-section dependence. Therefore, second-generation cointegration tests should be preferred if a correlation occurs between the cross-section units.

Westerlund’s (2006) panel LM cointegration test with multiple structural breaks is used to examine the presence of a long-term relationship among the variables because it takes into account cross-sectional dependence and slope heterogeneity when estimating the long-term cointegration relationship among variables where traditional tests do not.

Westerlund (2006) proposed a simple test for the null hypothesis of cointegration that accommodates structural changes in the deterministic component of a cointegrated panel regression. The test is based on McCoskey and Kao’s (1998) LM test and can provide a constant for *n* numbers of breaks and the trend for individual regressions that are observable at different times for different units. The test statistics are derived when the locations of the breaks are known *a priori* and are determined endogenously from the data. The test statistics are also derived when no break occurs yet the deterministic component includes individual-specific constant and trend terms. Westerlund evaluated the small-sample performance of the test using Monte Carlo simulations. The results suggest the test to have small size distortions and reasonable estimating power (Westerlund, 2006, p. 102).

Consider the multidimensional time-series variable y_{it} observable for the cross-section $I = 1, ..., N$ and time series $t = 1, ..., T$. The data generating process (DGP) for y_{it} is given by the following system of equations:

$$y_{it} = z'_{it}\gamma_{ij} + x'_{it}\beta_i + e_{it} \quad (4)$$

$$e_{it} = r_{it} + u_{it} \quad (5)$$

$$r_{it} = r_{it-1} + \phi_i u_{it} \quad (6)$$

a) where $x_{it} = x_{it-1} + v_{it}$ is a K-dimensional vector for the regressions and z_{it} is a vector for the deterministic components. The corresponding vectors for the parameters are denoted β_i and γ_i respectively. The index of $j = 1, \dots, M_i + 1$ is used to denote structural breaks where M_i is the maximum number of breaks; in other words, it has $M_i + 1$ regimes found for the dates $T_{i_1}, \dots, T_{i_{Mi}}$, where $T_{i_0} = 1$ and $T_{iM_i+1} = T$. Furthermore, the initial value of r_{it} is assumed to be zero, which entails no loss of generality as long as z_{it} includes an individual-specific intercept. For convenience in constructing the test and in deriving its asymptotic distribution, we have assumed vector $w_{it} = (u_{it}, v'_{it})'$ to be cross-sectionally independent and to follow a general linear process (Westerlund, 2006, p. 103).

b) The processes driving the unit root and stationary components of the composite error term in Eq. (5) are assumed to be highly correlated with the parameter ϕ_i, which reflects their relative weight. Thus, the null hypothesis that all individual units of the panel are cointegrated can be stated equivalently as (Westerlund, 2006, p. 105):

$H_0 = \phi_i = 0$ for all i = 1, …, N

as opposed to

$H_1 = \phi_i \neq 0$ for all i = 1, …, N and $\phi_i \neq 0$ for $i = N_1 + 1, \ldots, N$

The panel LM test statistic is defined as follows:

$$Z(M) \equiv \sum_{i=1}^{N} \sum_{j=1}^{M_i+1} \sum_{t=T_{ij}+1}^{T_{ij}} \left(T_{ij} - T_{ij-1}\right)^{-2} \widehat{\omega}_{i1.2}^{-2} S_{it}^{2} \quad (7)$$

Where

$\widehat{\omega}_{i1.2}^{2} = \widehat{\omega}_{i11}^{2} - \widehat{\omega}_{i21}' \widehat{\Omega}_{i22}^{-1} \widehat{\omega}_{i21}$ and $S_{it} = \sum_{k=T_{ij-1}}^{t} \hat{e}_{ik}^{*}$ with $\hat{e}_{it}^{*}$ being any efficient estimate of e_{it}.

According to the results obtained from the test, the cointegration relationship behaves in accordance with the presence of a cross-section dependency among the countries in the panel. If no cross-section dependency occurs among the countries, the asymptotic probability values of the test are taken into consideration, whereas in the case of a cross-section dependency, the bootstrap probability values of the test are checked. Both asymptotic and bootstrap probability values are compared at a significance level of $p < 0.05$ to determine the presence of cointegration at a 5% significance level. If the probability value of the calculated test is greater than 0.05, a cointegration relationship is assumed to be present between the series, thus accepting H_0.

Estimating the Panel Cointegration Coefficients

When a cointegration relationship is present between variables, the next step is to estimate the long-term coefficients between these variables. Some considerations are important in choosing the estimator to be used for this. First, the probability of the slope coefficient being different for the cross-section units increases for larger time durations (*T*). Choosing among the conventional methods (*e.g.*, fixed effects, random effects) implies the slope parameters being the same for all cross-section units, as these estimators only allow for differentiating the intercepts when all other coefficients and error variances are the same across groups (Pesaran et al., 1999, p. 621). The problem of non-stationarity is also possible with larger T durations. The second important issue is the presence of a cross-section dependence. If a correlation exists between cross-section units, the preferred estimator should be robust against cross-section dependence.

Although first-generation estimators such as the mean group estimator (MG; Pesaran & Smith, 1995; Pesaran et al., 1997) and the pooled mean group estimator (PMG; Pesaran et al., 1997) allow for heterogeneous slope parameters in the panel time series analysis, they are not robust to cross-section dependence. The augmented mean group (AMG) estimator (Eberhardt & Bond, 2009; Eberhardt & Teal, 2010) is one second-generation estimator that eliminates these constraints. Eberhardt & Bond (2009) suggested heterogeneity, non-stationary variables, and cross-sectional dependence to cause serious bias in standard panel estimators, and various diagnostic tests have confirmed this claim. Therefore, they recommended the AMG estimator as a two-step method. The model proposed by Eberhardt & Bond (2009) is as follows:

$$y_{it} = \beta_i' x_{it} + u_{it} \qquad u_{it} = \alpha_i + \lambda_i' f_t + \varepsilon_{it} \tag{8}$$

$$x_{mit} = \pi_{mi} + \delta_{mi}' g_{mt} + \rho_{1mi} f_{1mt} + \ldots + \rho_{nmi} f_{nmt} + v_{mit} \tag{9}$$

$$m = 1, \ldots, k \text{ and } f_{mt} \subset f_t$$

$$f_t = \varphi' f_{t-1} + \varepsilon_t \quad \text{and} \quad g_t = \kappa' g_{t-1} + \varepsilon_t \tag{10}$$

where $i = 1, \ldots, N$ and $t = 1, \ldots T$, x_{it} is a vector of the observable variable. β_i' is the country-specific slope parameter over the observed regressor; u_{it} includes what is unobservable and ε_{it} are the error terms. α_i is the combination of group-specific fixed effects, f_t is the set of common factors, and λ_i are the factor loads specific to the cross-section units. $\lambda_i, \delta_i,\ and\ \rho_i$ are the country-specific factor loads. Eq. (10) shows f_t and g_t to be the non-observable common factors affecting all cross-sections. This equation provides an empirical representation of k observable variables modeled from these common factors. Therefore, this model demonstrates the cross-section dependence present in the observable and non-observable variables.

The estimate using the AMG estimator occurs in two steps (Eberhardt & Bond, 2009). The first step can be shown as:

$$\Delta y_{it} = b^{'}\Delta x_{it} + \sum_{t=2}^{T} c_t \Delta D_t + e_{it}$$
$$\Rightarrow \hat{c}_t \equiv \hat{\mu}_t^{\bullet} \qquad (11)$$

The first step in Eq. (11) estimates the model by using the first differences between the variables, the reason being that the non-stationary variables and non-observable factors are assumed to have biases with the variables at their level in the regression model estimates. Thus, the dummy coefficients for year (indicated by $\hat{\dot{\eta}}_t$) are obtained.

In the second step, the estimated model is calculated as follows:

$$y_{it} = \alpha_i + b_i^{'} x_{it} + c_i t + d_i \hat{\mu}_t^{\bullet} + e_{it}$$
$$\hat{b}_{AMG} = N^{-1} \sum_i \hat{b}_i \qquad (12)$$

The second step shown in Eq. (12) includes $\hat{\dot{\eta}}_t$ in the regression for each cross-section unit. A linear trend term is also included in the regression. AMG estimates are derived as the average of estimates for the individual countries.

Globalisation Index, de facto	Weights	Globalisation Index, de jure	Weights
Economic Globalisation, de facto	***33.3***	***Economic Globalisation, de jure***	***33.3***
Trade Globalisation, de facto	*50*	*Trade Globalisation, de jure*	*50*
Trade in goods		Trade regulations	
Trade in services		Trade taxes	
Trade partner diversity		Tariffs	
		Trade agreements	
Financial Globalisation, de facto	*50*	*Financial Globalisation, de jure*	*50*
Foreign direct investment		Investment restrictions	
Portfolio investment		Capital account openness	
International debt		International Investment Agreements	
International reserves			
International income payments			
Social Globalisation, de facto	***33.3***	***Social Globalisation, de jure***	***33.3***
Interpersonal Globalisation, de facto		*Interpersonal Globalisation, de jure*	
International voice traffic		Telephone subscriptions	
Transfers		Freedom to visit	
International tourism		International airports	
International students			
Migration			
Informational Globalisation, de facto		*Informational Globalisation, de jure*	
Used internet bandwidth		Television access	
International patents		Internet access	
High technology exports		Press freedom	
Cultural Globalisation, de facto		*Cultural Globalisation, de jure*	
Trade in cultural goods		Gender parity	
Trade in personal services		Human capital	
International trademarks		Civil liberties	
McDonald's restaurant			
IKEA stores			
Political Globalisation, de facto	***33.3***	***Political Globalisation, de jure***	***33.3***
Embassies		International organisations	
UN peace keeping missions		International treaties	
International NGOs		Treaty partner diversity	

Source: https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html

Overall indices for each aggregation level are calculated by the average of the respective de facto and de jure indices.