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## TIME HUMAN DEVELOPMENT INDEX FOR MENA AND EU-28 COUNTRIES

The economic and social conditions of a country determine its Human Development, which is the key determinant of their appeal for immigrants. The United Nations calculates a Human Development Index (HDI) for most countries; however, this fails to include time as the fourth important dimension. This paper compares the Time Human Development Index (THDI) for Middle Eastern and North African (MENA) countries with the THDI for European Union (EU-28) countries. The THDI takes into account the non-observable variable: time. The results suggest that, in mean terms, EU-28 countries are much more attractive according to their THDI and HDI than MENA countries.

Keywords: Euro-Mediterranean countries, living conditions, social sciences, index, multiequational, GDP. JEL Classification: C1, F5, I0, O0, O1.

## 1. Introduction

The relationship with parents or other citizens could be the main explanation that attracts people to live in one place or another. In some countries with certain characteristics this decision is not superfluous. Life expectancy could also be very different among countries. Quality of life, risk of murder and other facts, may also change the decision where people want their children to grow up.

[^0]In a nutshell, immigration is a reality for many countries, and many reasons stand for this immigration conglomeration: job possibilities, public insurances that cover specific diseases, or previous known immigrants in the city that can facilitate adaptation. Additionally, the previous development of immigrants changes completely the evolution of the development of that country, making it even much more appealing for other immigrants. There is a crowding-in effect that produces a concentration of people of similar characteristics. Classical resources (labor, land and capital) are not necessarily determinants of immigration concentration although Life Expectancy and Human Development could be related to those classical resources.

## FIGURE 1 <br> MENA COUNTRIES



NOTE: Middle East and North Africa Region (MENA).
SOURCE: www.greenprophet.com. Last view 1 April 2017.

One index can weight all possible reasons for an increase in the amount of immigration in a certain country. United Nations (UN) calculates an index for most countries, including the Middle East and North Africa (MENA) countries, although it lacks from the fourth important dimension, time. The conditions of a country change over the time, and the weights of the different variables should be sensitive to them.

This paper compares the Time Human Development Index (THDI) of the MENA countries with the Time Human Development Index (THDI) of the European Union (EU28) countries. The THDI takes into account the nonobservable variable, time, using the same variables than the UN (Life Expectancy Rate, Gross Enrolment Rate, Gross Domestic Product and Literacy Rate). Time evolution is crucial for every single of the four variables (Compton-Lilly, 2016). The methodology to calculate
this index is a theoretical mathematical evolution of the multivariate classical dimension reduction (Ibar-Alonso, Cosculluela Martínez and Hewings, 2017). For other methodologies see Alkire and Santos, 2010; Antony and Rao, 2007 and the Bible in indexes (Nardo et al., 2005).

Considering that MENA countries have peculiar characteristics (see empirical analysis in Abu-Bader and Abu-Qarn, 2008; Abu-Qarn and Abu-Bader, 2007; Ben Naceur and Omran, 2008; Guetat and Serranito, 2007; Kar, Nazlıoğlu and Ağır, 2011; Mohamed and Sidiropoulos, 2010) and taking into account that the index does not leave aside the time evolution comparing countries of EU-28 with those of MENA region, our hypothesis are:

HO: According to the new index, the countries occupying top positions in the ranking are not necessarily the EU-28.

H1: Countries that have natural petrol resources are the best of all the MENA countries.

The rest of the article is structured as follows: section 2 (Methodology) accounts for the methodology used; section 3 (Empirical analysis) shows the methodology application to the data; section 4 (Analysis and results) analyzes the results obtained; and, finally, section 5 (Discussion and conclusions) provides the conclusions from the study and proposes future areas of research.

## 2. Methodology

This paper is built on the Ibar-Alonso et al., 2017, where it has been demonstrated that the methodology used taking time into account, is appropriate on the basis of considering all UN countries database. The main difference in the ranking is grounded only on the concentration of Euro-Mediterranean countries.

The methodology classifies countries into groups, with a classical hierarchical cluster analysis by means of the Square Euclidean distance and validated with a Discriminant analysis. Thus, Fisher functions allow to classify the countries in each group for which an index is calculated by a weighted average with different weights for each group of countries.

The different weights for the same variables in each one of the groups have been calculated on the basis of the standard deviation of confidence intervals of the forecast of the variables. The process followed to forecast the variables is a vector autoregressive moving average model (VARMA) for each one of the groups resulting from the cluster analysis. In accordance, the time dimension of similar countries is considered.

The VARMA allows an equation set in which the endogenous variables in each one of them is affected instantaneously and lagged by the other variables. The dynamic relations, if they are found, change the evolution of all variables accordingly to their influences. The recursive process of parametric
test of significance of all the variables in each one of the equations has been considered with a 90 per cent confidence. The lag order of the non-stationary VARMA has been determined by the classical AIC (Akaike Information Criteria).

The possible co-integration relations will be tested by the classical Engle and Granger (1987) and Johansen $(1988,1991)$ procedures. The main instant influence of variables has been restricted in a biphasic way, concerning the idiosyncrasy of the variables, and it has been done through the residuals of each equation. The first phase of the diagonalization of the model takes into account that adult literacy, gross enrolment and GDP rates affect instantaneously life expectancy rate. Obviously, in most developed countries life expectative is higher and high quality medical care services are available for almost all citizens. The second phase assumes that adult literacy and gross enrolment rates affect instantaneously GDP, involving a direct instant effect of adult literacy and gross enrolment on GDP, while there is no reverse influence; an increase in GDP will not necessarily imply instantaneously an investment in adult literacy or gross enrolment rates.

The forecast of all variables takes direct and indirect effects into account, so the time consideration is not only based on the evolution of each variable separately, as it would be the case with an univariate model. The estimated model is a dynamic multiequational double phase orthogonalized model.

The computed parameters to compute the index is the standard deviation median rate, obtained from the bootstrap 95 per cent confidence interval over the last 5 periods.

The methodology allows taking into account the nonobservable variable, time, using the same variables than the UN (Life Expectancy Rate, Gross Enrolment Rate, GDP and Literacy Rate), without too many restrictions, to calculate a Human Development Index which could be a fact for immigration concentration.

## 3. Empirical analysis

The multivariate procedure clusters the countries into three groups which are differenced by their profiles accordingly to their historical data. The considered variables are integrated of order one (1), and no integration analysis has been required. The lag order of the VARMA model has been determined by «Akaike Information Criteria» as one for groups 2 and 3, and three for the first group ${ }^{1}$. The ANOVA test reveals that the means are significantly different in the three groups. Wilk's lambda suggests that Fisher functions to classify the countries in the three groups are appropriate.

## 4. Analysis and results

Table 1 displays Time Human Development Index and Human Development Index for all countries in 2010 and 2014, except Germany, Palestine, Iraq, Syria and Yemen for which it is not possible to calculate the index for 2010 since these countries are missing some data.

The resultant values for each country that help to build the ranking will be published as open data in the web page https://sites.google.com/site/re-alillinois5/; following the 19/2013 Law, 9 ${ }^{\text {th }}$ December, for researchers in line with (Rico, Merelo and Hinojosa, 2016).

Final estimations assign GDP around 60-75 per cent of the final weight followed while Gross Enrolment Rate accounts for 10-25 per cent. Thus, the TDHI is expected to be much more correlated to the income per capita than the HDI.

Comparing both indexes Qatar stands out as a singularity; while UN ranks Qatar in position number 20 for 2010 and 13 for 2014, THDI ranks it in first place, consistently with the fact that the index considers the time dimension. Time evolution shows an increase in UN ranking from 2010 until 2014 of 7 positions in the case of Qatar, drawing an impressive acceleration

[^1]rate. Also, Kuwait, Saudi Arabia, United Arab Emirates which have liquid gold and can influence the world' economy stand in the first positions.

There are no significant differences in the position of other countries from one index to the other, except for the countries that joined the EU «recently». Bigger differences arose in 2014 while there was practically no difference in 2010 for Estonia, Slovakia and Slovenia. Belgium, France, Spain and United Kingdom increase their distances to head positions over time. Either acceleration rate of certain variables in the countries that are considered as the ones with natural petrol resources is very fast, or has been very fast from 2010 to 2014, either the world crisis affected much more to those European countries.

Figure 2 shows the THDI in 2014 for EuroMediterranean countries.

Conclusions attained from Figure 2:

- First: MENA countries are in the first or in the last quartile.

Out of 50 countries, 63 per cent of MENA countries are below the $26^{\text {th }}$ percentile of the THDI ranking.

Four MENA countries ( 24 per cent of them) are in the first quartile.

The divergence among MENA countries is high. Life Expectancy, GDP, Gross Enrolment and Literacy rates are very different in Qatar than those in Yemen or Sudan.

- Second: three MENA countries are in the first places of the ranking.

Qatar, Kuwait and Saudi Arabia positions are the first, third and fourth, while the only EU-28 country is Luxembourg in the second position.

Countries in the first positions tend to be the ones which are more attractive for immigration.

## 5. Discussion and conclusion

The Human Development has been measured by an index which considers the time dimension. The procedure classifies the countries into groups, with a classical

## TABLE 1

TIME HUMAN DEVELOPMENT INDEX (THDI) AND HUMAN DEVELOPMENT INDEX (HDI) FOR ALL COUNTRIES (EXCEPT GERMANY, PALESTINE, IRAQ, SYRIA AND YEMEN) RANKING FOR 2010 AND 2014

|  | 2010 |  | 2014 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Country | HDIa | THDI ${ }^{\text {a }}$ | HDI ${ }^{\text {b }}$ | THDI ${ }^{\text {b }}$ | Grupo |
| Qatar ......................................... | 20 | 2 | 13 | 1 | MENA |
| Luxembourg ................................. | 4 | 1 | 49 | 2 | EU-28 |
| Kuwait ........................................ | 16 | 4 | 40 | 3 | MENA |
| Saudi Arabia .............................. | 31 | 23 | 26 | 4 | MENA |
| Netherlands ................................ | 1 | 5 | 20 | 5 | EU-28 |
| Ireland .................................. | 2 | 6 | 6 | 6 | EU-28 |
| Denmark ............................... | 5 | 7 | 14 | 7 | EU-28 |
| United Arab Emirates .................... | 19 | 3 | 29 | 8 | MENA |
| Austria ..................................... | 10 | 8 | 1 | 9 | EU-28 |
| Sweden ..................................... | 7 | 10 | 30 | 10 | EU-28 |
| Germany ................................... | - | - | 4 | 11 | EU-28 |
| Oman ........................................ | 33 | 25 | 31 | 12 | MENA |
| Finland ................................. | 3 | 9 | 45 | 13 | EU-28 |
| Belgium ................................. | 9 | 11 | 43 | 14 | EU-28 |
| Bahrain ..................................... | 22 | 19 | 7 | 15 | MENA |
| France ................................. | 6 | 12 | 36 | 16 | EU-28 |
| United Kingdom ........................... | 13 | 13 | 34 | 17 | EU-28 |
| Spain ........................................ | 8 | 14 | 19 | 18 | EU-28 |
| Italy | 11 | 16 | 38 | 19 | EU-28 |
| Israel .................................... | 14 | 17 | 18 | 20 | MENA |
| Czech Republic .......................... | 21 | 22 | 21 | 21 | EU-28 |
| Slovenia ..................................... | 15 | 18 | 47 | 22 | EU-28 |
| Slovakia .................................... | 25 | 24 | 11 | 23 | EU-28 |
| Estonia .................................... | 27 | 28 | 42 | 24 | EU-28 |
| Malta ................................... | 23 | 26 | 28 | 25 | EU-28 |
| Cyprus .................................... | 18 | 21 | 39 | 26 | EU-28 |
| Lithuania .................................. | 30 | 32 | 41 | 27 | EU-28 |
| Latvia | 32 | 33 | 5 | 28 | EU-28 |
| Poland | 24 | 29 | 3 | 29 | EU-28 |
| Portugal | 17 | 20 | 48 | 30 | EU-28 |
| Hungary .................................... | 26 | 27 | 24 | 31 | EU-28 |
| Greece ...................................... | 12 | 15 | 32 | 32 | EU-28 |
| Libya | 29 | 30 | 2 | 33 | MENA |
| Croatia | 28 | 31 | 17 | 34 | EU-28 |
| Romania | 34 | 34 | 16 | 35 | EU-28 |
| Bulgaria | 35 | 36 | 8 | 36 | EU-28 |
| Lebanon ............................... | 36 | 35 | 10 | 37 | MENA |
| Iran | 37 | 37 | 44 | 38 | MENA |
| Jordan | 39 | 40 | 27 | 39 | MENA |
| Algeria ............................ | 40 | 39 | 25 | 40 | MENA |
| Egypt ....................................... | 41 | 41 | 23 | 41 | MENA |
| Tunisia ........................................ | 38 | 38 | 35 | 42 | MENA |
| Iraq | - | - | 22 | 43 | MENA |
| Palestine, State of ......................... | - | - | 9 | 44 | MENA |
| Morocco ...................................... | 42 | 42 | 15 | 45 | MENA |
| Yemen ........................................ | - | - | 46 | 46 | MENA |
| Sudan | 43 | 43 | 37 | 47 | MENA |
| Syrian Arab Republic ...................... | - | - | 33 | 48 | MENA |
| Djibouti ........................................ | 44 | 44 | 12 | 49 | MENA |

[^2]
## FIGURE 2

## MENA AND UE-28 COUNTRIES THDI IN 2014



SOURCE www.greenprophet.com.Last view 1 April 2017.
hierarchical cluster analysis by means of the Square Euclidean distance validated with the Discriminant analysis. The index is computed by a weighted average with different weights for each group of countries. The weights of the variables for each one of the groups differ accordingly to the rate of growth of the standard deviation of the 95 per cent bootstrap confidence intervals of the forecast of the corresponding variables. The forecasting has been done adjusting a VARMA model to historical data.

Results suggest that the countries occupying the first positions in the ranking are those which have the gold liquid and can influence the world economy (Qatar, Kuwait, Saudi Arabia and United Arab Emirates). In these countries the rate of growth or the acceleration rate of an important variable has been rampant from 2010 to 2014, e.g. Life Expectancy Rate.

Thus, answering to the first hypothesis,
HO: Accordingly to the new index, the countries occupying the top positions in the ranking are not necessary EU-28.

- Effectively, the first positions in the ranking that considers the time evolution are for MENA countries (only Luxembourg occupies the second position).
- The last quartile is also occupied by MENA countries; those countries are the ones that have less percentage of people with access to electricity (Figure 3). In Djibouti only 50 per cent of population has access to the electricity and there is no access at all in rural places nowadays (2014). Sudan and Yemen follow Djibouti in having the lower percentage of population with access to electricity. Accordingly, those countries are the ones with less electricity consumption in 2014 (World Bank, 2017 database ${ }^{2}$ ).
- Qatar and Finland account for high electricity consumption and one country in the middle of the ranking outstands as the one with highest electricity consumption in 2014: Bahrain (World Bank, 2017 database ${ }^{3}$ ).

[^3]FIGURE 3
COUNTRIES ACCESS TO ELECTRICITY
(Percentage of population)

..e. Access to electricity, rural (\% of rural population)

- Access to electricity (\% of population)
- Access to electricity, urban (\% of urban population)

SOURCE: World Development Indicators Database. Last updated 2nd February 2017.


The second hypothesis,
H1: Countries that have natural petrol resources outperform the rest of the MENA countries.

The answer is yes; the best-ranked countries of MENA are the ones with petrol resources.

MENA countries are becoming highly attractive for immigrants to work and live, especially those with natural petrol resources. The methodology used is appropriate
to measure the development of a country taking into account its time evolution.

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En el próximo número de
Información Comercial Española. Revista de Economía

## EL SECTOR MARÍTIMO EN LA ECONOMÍA Y EL COMERCIO




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[^1]:    ${ }^{1}$ All tests and diagnoses will be provided by authors under request.

[^2]:    NOTES: HDI ${ }^{\text {a }}$ and HDI ${ }^{b}$ are the indexes computed by the UN. THDI ${ }^{\text {a }}$ and THDI $^{\text {b }}$ are the indexes computed taking into account the dimension time.
    SOURCE: Prepared by the authors based on the UN development Index Database.

[^3]:    ${ }^{2}$ Last access 1st July 2017, http://databank.worldbank.org
    ${ }^{3}$ Last access 1st July 2017, http://databank.worldbank.org.

