Economic Growth, Productivity and Convergence of the Middle East and North African Countries

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Abstract

The present study tried to understand spatial and temporal variation in economic growth and productivity of Middle East and North African Region for the period 1971-2014. Further, we also tested the hypothesis of regional convergence in neo-classical framework. The study is based on the Penn World Table data of sample of Middle East and North African countries. Our findings suggests that oil-dependent economies have shown large variations in growth which can be linked with the fluctuations of oil price. Due to rapid population and labour force growth (both nationals and immigrants) in most of the oil based economies, growth rates of per capita GDP and per worker GDP are quite meagre. Total factor productivity does not play a significant role and growth in the region is due to the capital accumulation. Both beta and sigma measures of convergence suggest that there is convergence in per worker GDP (labour productivity) and per capita GDP.

Key words: economic growth; growth accounting; convergence; MENA

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1. Introduction

Economic performance of West Asian and North African region (henceforth, WANA)[3] is quite dismal despite having abundant natural resources (especially oil and natural gas) and large rent inflows. Sustaining stable economic growth is one of the central problems facing most of the WANA countries. Countries in the WANA region are similar in many respects like shared history, language, culture, geography and political regimes. Despite being similar on so many fronts there are important differences as well. In economic sphere the region can be divided into two sets of countries: First, those having a large reserve of oil (oil-rich countries) and are net exporters of oil, second, countries having little or no oil reserve (non-oil countries) and are net importers of oil. To any naïve observer, it may seem that economic problems of these two groups of nations are quite different and there is no need for joint study of these two groups. The first group, with large rent inflows from oil exports and little population to support (in most of the cases), is placed in the altogether different sphere in contrast with the second group, where resources to support their respective populations is quite limited. There are at least three channels through which these two groups are interconnected and needs to be studied in conjunction with each other: the first is labour migration from resource-poor nations to resource-rich nations and remittance flows thereby, the second is capital flows (Investments, aids and donations), last but not the least; continuous political events like Wars, conflicts and revolutions having regional repercussions.

To explain dismal performance of many resource-based economies, literature largely adopted 'resource curse' thesis. The basic argument of the 'resource curse' is that the economies heavily dependent upon natural wealth are less likely to do well both on economic and political fronts. The thesis is well supported by empirical studies most notably by (Sachs & Warner, 1995) which suggests a strong negative correlation between natural resource availability and economic growth. It is believed that dependence on natural resources causes Dutch disease[4], poor human capital, volatility in revenues, political authoritarianism and violence and conflict and prohibits economic diversification. All these issues are visible in WANA region. Dependence on oil revenue makes them vulnerable with respect to demand and price fluctuations in World oil market. Extreme dependence on oil of both groups of countries is likely to make their growth unsustainable and volatile. Dependence on oil created a state-led development model for most of the countries in the region and re-orientation of policies towards higher efficiency and growth led by private sector had been difficult even during the period of low oil revenues (Yousef, 2004). Further, political events in the form of war, revolution and violent conflicts are also detrimental to regional growth.

[3]WANA region (West Asia and North Africa)is also widely known as Middle East and North Africa (MENA). For our purpose it includes following 19 Countries until stated otherwise: Yemen, Oman, UAE, Qatar, Bahrain, Kuwait, Saudi Arabia, Iraq, Iran, Syria, Turkey, Lebanon, Palestine, Jordan, Egypt, Libya, Tunisia, Algeria and Morocco. Israel is excluded since its economic issues are different from others and it is following a different economic model.

[4] Domestic currency appreciates in response to large export of natural resource and revenue inflows making tradable goods less competitive in world markets. Dutch disease is named after this phenomenon occurred in Dutch after discovery of huge natural gas field.

With this background the purpose of this study is quite restricted where we tried to focus only on the economic performance of the WANA countries with three specific questions:

1. Does the long-term economic performance as measured by growth of gross domestic product is satisfactory?
2. Does total factor productivity played significant role in sustaining growth?
3. Is there a convergence of income among WANA countries?

In exploring these issues we also tried to understand the interconnections and interdependencies of oil and non-oil economies.

First detailed analysis of the regional growth of WANA was done by (Barlow, 1982). The study was ambitious in the sense it first tried to prepare comparable data of per capita GNP for all countries for the period 1950-1972. During the period oil exporting countries were growing at a higher rate than non-oil countries. Political factors like War, Civil War and Decolonization were also playing a significant role. Countries with rapid population growth were growing at a slower rate.

The paper by (Esfahani, 2009) makes an effort to understand the role of social contracts in WANA that may throw light on why less interventionism has not been associated with better economic performance in the region. The more interventionist governments with fewer resource rents at their disposal moved earlier to generate revenues through export promotion. This created a growing private sector in favour of reform and engagement in globalization. Countries with larger resources developed more inward-oriented private sectors that were less inclined to support export promotion and policy dynamism. The study concludes that policies needed to initiate and enhance growth in each country have many specific components that require extensive local expertise.

In the paper by (Sala-i-Martin & Artadi, 2003), the authors analysed the economic growth performance in the Arab world over the period 1960 to 2000. The paper relates this poor performance of both oil and non-oil producers to investment. The decline in the investment rate during last two decades in the region is probably a consequence, not a cause, of this slowdown. The decline in the investment rate followed rather than preceded the reduction in the aggregate growth rate. We conclude that the low quality of investment projects is the key determinant of growth. The excessive reliance on public investment, the low quality of financial institutions, the bad business environment and the low quality of human capital are important determinants of systematically unproductive investment decisions and, thus, low economic growth.

2. Methodology

The selection of countries is based on the availability of continuous and comparable data. For growth and convergence analysis we needed data of aggregate output, population and workers. For growth accounting exercise data of inputs (labour, human capital and capital stock) is also needed.

2.1 Growth Accounting

We start with two-factor linearly homogenous Cobb-Douglas [5] (Robert E. Hall, 1999) production function with Hicks-neutral technical progress, as follows

$$Y_t = A_t K_t^{\alpha} (HL)_t^{1-\alpha} \text{ ..... (1)}$$

Where $\boldsymbol{Y_t}$ is aggregate output (real GDP), $\boldsymbol{K}$ is the aggregate stock of capital, $\boldsymbol{HL}$ is human capital augmented labour force, $\boldsymbol{A_t}$is an index of Total Factor Productivity (TFP) and is often considered to be a measure of the *efficiency* with which these inputs are used in the production process, and $\boldsymbol{\alpha}$ is positive exponent representing the elasticity of output with respect to capital. The complement of capital share gives the share of labour in output. These exponents of factor inputs are assumed to sum up to unity in compliance with Euler's theorem. The process of estimating Equation (1) is described as follows:

Taking natural log of Equation (1)

$$logY_t = logA_t + \alpha\, logK_t + (1-\alpha)\, log(H_t) + (1-\alpha) log(L_t) \text{..... (2)}$$

Equation (2) contains the main variables involved in the analysis of growth performance, decomposition of growth and the convergence process discussed below.

We can write Equation (2) as

$$y_t = a_t + \alpha k_t + (1-\alpha) h_t + (1-\alpha) l_t \text{..... (3)}$$

where small case letters represent the log of the corresponding capital letters. And differencing of Equation (3)[6] gives the growth rates of respective variables as follows:

$$(y_t - y_{t-1}) = (a_t - a_{t-1}) + \alpha(k_t - k_{t-1}) + (1-\alpha)(h_t - h_{t-1}) + (1-\alpha)(l_t - l_{t-1}) \text{ ..... (4)}$$

2.2 Convergence

To test the convergence hypothesis empirical literature largely relied on two different concepts. The first, known as beta convergence (β-convergence), applies if a poor economy tends to grow faster than rich and thereby the poor economy tends to catch up with the rich one (Barro & Sala-i-Martin, 1992). The second, known as sigma convergence (σ-convergence) looks into the cross-sectional variation. In this context, convergence occurs if the dispersion—measured, for example, by the standard deviation or coefficient of variation of output across a group of countries or regions, declines over time (Sala-i-Martin, 1996). Under certain conditions β-

[5]With constant returns to scale, Cobb-Douglas production function simplifies the estimation of exponent namely output elasticity of capital,$\boldsymbol{\alpha}$. Under perfect competition, output elasticity of capital and labour are approximated to their respective share.

[6] The derivative of a log of variable with respect to time is approximately equal to its growth rate.

convergence (poor countries tending to grow faster than rich ones) tends to generate σ-convergence (reduced dispersion of per capita income or product). Theoretically, there may be the difference between two but with real World data, whenever we observe σ-convergence we also observe β-convergence.

Systematic formulation of β-convergence is derived from the seminal work of (Solow, 1957). The model essentially describes a mechanism by which regions reach to steady-state equilibrium. Despite the restrictive conditions of this model two important conclusions can be drawn. First, regions will converge to a common steady state if the growth rate of technology, investment and labour force is identical across regions. Second, farther the region from its steady state, the faster would this region grow which leads to a more general prediction that poorer regions will grow faster than richer regions. The movements of factors across regions in search of higher returns would make this to happen. According to (Sala-i-Martin, 1996) , "convergence is more likely across regions of the same country rather than between the countries because the structural differences are likely to be smaller across regions of the same country".

Unconditional convergence signifies that the poorer regions tend to grow faster and catch-up with the richer ones. The formal estimation involves the following equation.

$$\frac{1}{T} ln \left[\frac{y_{it}}{y_{i0}}\right] = \alpha - \left[\frac{(1-e^{-\beta T})}{T}\right] lny_{i0} + \varepsilon_{i0,T} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

Where,$\boldsymbol{y_{it}}$ is the output of *i*-th unit at the current period and $\boldsymbol{y_{i0}}$ shows the output of the same unit at initial year. T is time period of the study. The dependent variable on left hand side represents the average growth rate and independent variable on right the hand side of the equation is the initial value of the output. For given T value, equation (5) can be reformulated as

$$\frac{1}{T} ln \left[\frac{y_{it}}{y_{i0}}\right] = \alpha + \lambda\, lny_{i0} + \varepsilon_{i0,T} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (6)$$

A negative value of the coefficient $\boldsymbol{\lambda}$ indicates that the poorer regions are growing faster than richer ones that will lead to convergence. Value of β can be interpreted as the speed of convergence towards steady state. Positive β coefficient indicates convergence.

The second concept of σ-convergence asserts that dispersion, measured by standard deviation, of real per capita income or GDP across countries shrinks over time. That is,

$$\sigma_t < \sigma_0 \quad \ldots\ldots \quad t=1, 2, 3\ldots T$$

$$\text{Or} \quad \frac{\sigma_t}{\sigma_0} < 1$$

Where σ_t is the standard deviation of $log(y_{it})$ across *i*th country and is given as

$$\sigma^2 = \frac{1}{T}\sum_{t=1}^{T}(y_{it}\text{-}\bar{y_t})$$

$$\sigma = \sqrt{\frac{1}{T}\sum_{t=1}^{T}(y_{it} - \bar{y_t})}$$

where *t* is the time period, *i* refers to different countries in the sample, y_{it} is the GDP per capita of country *i* at time *t*, $\bar{y}_t$ is the mean value of y_{it} at time *t*.

3. Data and Variables

This section outlines the data series and data sources related to the main variables involved in the present study. They consist of real GDP per capita, GDP per worker, the stock of physical capital, and human capital. As regards the data sources, we employed the newest version of Penn World Tables 9.0 (Feenstra, Inklaar, & Timmer, 2015).[7] Even though Penn World Table contains data from 1950 onwards but most of the countries in the WANA region have continuous data series from 1970. In the present study, we thus used the 1971-2014 period for which data is available for 15 countries.

To conduct a comparative analysis of growth performance, a measure of aggregate output denoted by $RGDP^o$, provided by Penn World Table (9.0), which represents output-side real Gross Domestic Product[8] at chained Purchasing Power Parity (in Million 2001 US $) has been employed.

Real GDP per capita is obtained as a ratio of real GDP and population. For the computation of Real GDP per worker, we need a measure of the labour force. For this purpose, we used series on employment variable given in Penn World Table (9.0), which gives the total number of persons engaged in an economic activity.

As a measure of physical capital stock, we employ the real physical capital series denoted by *rkna*–provided in Penn World Table (9.0). This capital stock series has been constructed by using *perpetual inventory method* along with estimates of depreciation rates of capital stock as follows:

$$K_t = I_t + (1 - \delta)K_{t-1}$$

Where K_t is the capital stock available at time *t* , K_{t-1} is the capital stock left over from period *t*-1, δ is a constant depreciation rate, I_t is the investment or capital purchase at time *t*. Capital stock in Penn World Table has been adjusted for differences in asset composition between countries and over time. More specifically, capital stock (Feenstra, Inklaar, & Timmer, 2015) is accumulation of depreciation-adjusted-investments in four types of assets: structures (including residential and non-residential), machinery (including computers, communication

[7]Penn World Tables is a leading source of data for National Income Accounts related variables converted to international prices. It allows valid comparisons of GDP series among countries and is highly suitable for long term analysis.

[8] Output-side real GDP allows comparison of productive capacity across countries and overtime. And it is estimated by using prices for final goods, exports, and imports that are constant across countries (Feenstra, Inklaar, & Timmer, 2015).

equipment and other machinery), transportation equipments and other assets (including software, other intellectual property products and cultivated assets).

Following (Mincer, 1981)[9], we employ human capital index series provided in Penn World Table (9.0). This index is obtained on the basis of average years of schooling for the population aged 15 and over interpolated from (Barro & Lee, 2013) and an assumed rate of return for primary, secondary and tertiary education provided by (Psacharopoulos, 1994) survey of wage equations. Using these inputs, the human capital index may be constructed as follows:

$$h_{it}=e^{\emptyset(s_{it})}$$

where s_{it} represent the average number of years of education of the adult population in country i and $\emptyset(s_{it})$ is a piecewise linear function, with a zero intercept and a slope of 0.13 through the 4th year of education, 0.10 for the next 4 years, and 0.07 for education beyond the 8th year. Clearly, the rate of return to education is

$$\frac{dlnh_{it}}{ds_{it}} = \emptyset'(s_{it})$$

As regards the last ingredient required by Equation (3), namely α, the PWT data provide a variable *labsh*, which is an estimate of labour's share, or 1 – α. The share of capital input, α, is taken to be the complement of labour share. Empirically α is estimated to be constant, our study is more general in that the shares are allowed to vary over time. Thornqvist (1936)[10] dealt with this problem by measuring the growth rate between two points in time, $t-1$ and t, by logarithmic differences and by using as weights the arithmetic average of the factor shares at time $t-1$ and t (Equation 4). With this approach, the TFP growth is approximated in the Hicks-neutral case by

$$(\alpha_t - \alpha_{t-1}) \cong (y_t - y_{t-1}) - (\alpha_{t-1} + \alpha_t)/2(k_t - k_{t-1}) + (1 - [\alpha_{t-1} + \alpha_t]/2)(h_t - h_{t-1}) + (1 - [\alpha_{t-1} + \alpha_t]/2)(l_t - l_{t-1}) \quad \text{.....(7)}$$

where,

$(\alpha_{t-1} + \alpha_t)/2$ is the average share of capita for period $t-1$ and t.

4. Results and Analysis

4.1 Selected Statistics of WANA Countries

In this section, we briefly discuss some of the broad aggregates of WANA countries. Table 1 provides some basic statistics of some selected WANA countries. Not all countries in the WANA region have been included in our sample, because of the data limitations. There are

[9] Mincer (1981) argued that raw labour and human capital are essentially the same thing in contrast Mankiw, et. al. (1992) view.

[10] Thornqvist index is a weighted sum of the growth rates of total output, where weights are equal to the arithmetic mean of the input-shares. It is a more general index over the constant base-year weighted indexes. Thornqvist index allows weights to vary.

some important differences between the countries in the region. While Iran, Turkey and Egypt had a population of over 75 million each in 2014, Bahrain, Kuwait and Qatar had a population below 4 million. Similarly Gross Domestic Income per capita at dollar purchasing power parity prices of 2011varied significantly from a low of $440 to about $1,51,760 for Qatar. One salient feature of the WANA region is rapid population growth of 2.32 percent[11] during the past four decades. This growth rate is highest across all the regions of the world. Qatar and UAE registered 6.30 percent and 7.57 percent population growth rates respectively due to expansionist policy to attract expatriate labour force to support various economic activities (Arab Monetary Fund, 2016). There are certainly other important differences between the countries which will be highlighted in the sections to follow.

Table 1: Basic Aggregates for Selected Countries in the WANA Region

	Real GDP (Billion)		Population (Million)		Real GDP per capita(Thousands)	
Countries	1971	2014	1971	2014	1971	2014
Oil-dependent countries						
Bahrain	4.32	53.29	0.22	1.36	19.55	39.13
Kuwait	102.03	260.11	0.81	3.75	126.30	69.31
Oman	4.61	161.08	0.75	4.24	6.15	38.03
Qatar	11.20	329.64	0.12	2.17	93.95	151.76
Saudi Arabia	201.24	1487.96	6.10	30.89	33.01	48.18
UAE	67.19	636.90	0.28	9.09	244.19	70.10
Iran	230.38	1218.37	29.28	78.14	7.87	15.59
Iraq	32.04	430.02	10.26	35.27	3.12	12.19
Algeria	93.34	509.31	14.96	38.93	6.24	13.08
Non-oil dependent countries						
Turkey	233.09	1525.26	35.61	77.52	6.55	19.67
Tunisia	14.21	118.66	5.17	11.13	2.75	10.66
Egypt	38.64	968.57	35.56	89.58	1.09	10.81
Jordan	5.31	88.01	1.74	7.42	3.05	11.87
Morocco	34.21	249.68	16.39	33.92	2.09	7.36
Syria	22.06	83.36	6.60	18.77	3.34	4.44
WANA	1093.87	8120.23	163.84	442.19	6.68	18.36
Oil	746.35	5086.69	62.77	203.85	11.89	24.95
Non-oil	347.51	3033.54	101.07	238.34	3.44	12.73

Source: Penn World Tables (9.0) and authors own calculations.

4.2 Evolution of Growth

This section examines the growth performance of the WANA region. Over the last four decades, the growth trajectory of WANA countries remained very dismal given its potential.

Table 2 displays average growth rates for all WANA countries from 1971-2014. GDP increased at a rapid rate. In fact, three of the oil-rich countries, Oman, UAE, and Iraq achieved double-digit growth rates. Although Kuwait and Iran have substantial oil resources, they registered negative growth rates. Furthermore, non-oil exporting countries, except Syria, performed relatively well during 1970's mainly due to the remittances, foreign aid, FDI and trade from

[11] Calculations of the population growth rates are not shown in table.

oil exporting countries(Al-rawashdeh & Al-nawafleh, 2013)[12]. For the region as a whole, this situation has been reversed in the subsequent decade when oil prices plummeted. But there were significant differences among the oil-rich and non-oil countries (see Table 1). The following decade of 1990's witnessed a moderate recovery in growth performance owing to the rise in oil prices. Oil has been perceived to be used for fuelling growth in the WANA region. This empirical observation has been partially confirmed by our analysis; look at the last two decades of high growth following a rise in oil prices.

Table2: Compound Average Annual GDP Growth Rates

Countries	**1971-80**	**1981-90**	**1991-2000**	**2001-2014**	**1971-2014**	**volatility**
Oil-dependent countries						
Bahrain	8.15	-1.56	7.80	10.53	5.79	2.23
Kuwait	-1.94	-4.07	9.63	10.84	2.65	5.22
Oman	14.84	1.29	5.84	11.93	8.05	1.42
Qatar	5.22	-2.59	10.26	20.69	7.69	1.81
Saudi Arabia	8.02	-3.55	1.95	11.81	3.48	2.41
UAE	15.41	-2.94	4.37	7.00	4.56	2.28
Iran	-5.16	2.16	9.71	5.96	5.36	2.71
Iraq	11.08	1.48	11.86	15.36	4.05	2.43
Algeria	9.27	-1.82	2.02	5.87	2.90	1.63
Non-oil dependent countries						
Turkey	4.28	4.96	3.68	6.77	3.91	1.24
Tunisia	7.20	4.69	6.25	3.55	5.05	0.82
Egypt	4.86	5.51	10.93	9.44	8.32	0.81
Jordan	7.43	4.22	4.36	14.18	6.19	1.35
Morocco	5.71	7.52	2.26	6.27	4.52	1.11
Syria	-2.35	-2.52	6.32	7.98	3.79	3.74
WANA	4.97	0.80	5.23	8.53	4.39	1.20
Oil	5.27	-1.90	5.21	9.17	4.11	1.61
Non-Oil	4.30	5.09	5.23	7.53	4.90	0.86

Source: Penn World Tables (9.0) and authors own calculations

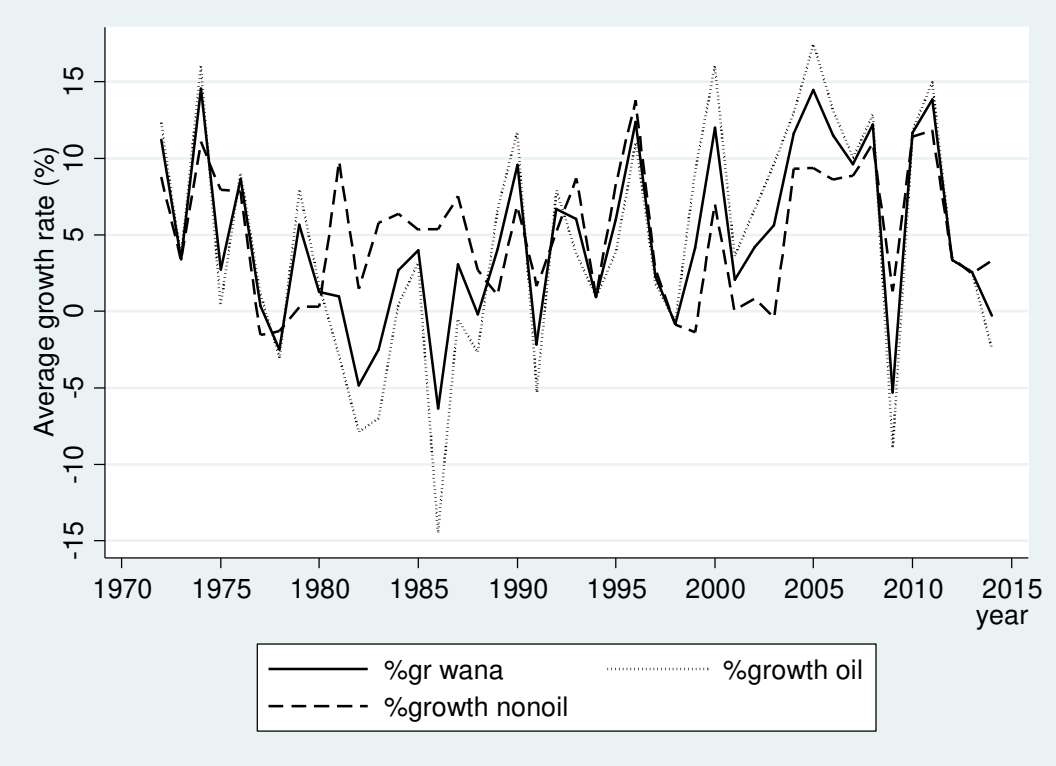
Notes: 1. Growth rates are calculated using the OLS regression $lnY_t = \alpha_1 D_1 + \alpha_2 D_2 + \alpha_3 D_3 + \alpha_4 D_4 + \beta_1 D_1 t + \beta_2 D_2 t + \beta_3 D_3 t + \beta_4 D_4 t + u_t$., where D_i, i =1,2,3,4 is a dummy for each decade.

Figure 1 shows the pattern of GDP growth over the period for the region along with two sub-groups of oil and non-oil countries. One salient feature of this growth performance is its high volatility[13].

[12] Ilahi & Shendy (2008) analysed 35 years panel data and estimated that the growth rates of real GDP, private consumption, private investment in the other WANA economies are significantly explained by financial and remittances outflows from the GCC countries. Whereas, the growth elasticity of financial flows is about 0.17-0.21, the growth elasticity of remittances is positive and statistically significant with coefficient of 0.07-0.09.

[13] The ratio of standard deviation and absolute mean of growth rates is the commonly used measure of growth rate volatility.

Figure 1: Annual growth rate of GDP (1971-2014)



As Figure 1 and last column of Table 1 shows volatility is larger for oil-rich countries (1.61) than non-oil countries (0.86). It implicitly shows the relation between oil prices and economic growth. More specifically economic growth in WANA countries is a function of energy prices. The graph drifts below zero during 1980's when energy prices declined. However, it remained fairly stable for non-oil countries. This high volatility in growth rates is attributable to several factors peculiar to the region. Among others, the most prominent are- lack of diversification which in turn increases vulnerability to external shocks, perennial regional conflict, political instability (Samir Makdisi, 2007) and low quality of investment projects, human capital, financial institutions and large share of the state in economic activities (Sala-i-Martin & Artadi, 2003).

Table 3and Figure 2 show the evolution of per capita GDP growth. Several stylized features emerge from them. For the overall period, annual growth rates are highly volatile. Volatility is large (3.88) in the case of oil-rich countries than the regional value of (2.36) and nonoil countries (1.40). Using a sample of 92 countries as well as OECD countries, (Ramey & Ramey, 1995) has found a statistically significant negative relationship between volatility and growth. Large volatility coupled with low growth rate, which is very clear in the case of oil exporting countries, serves as an indication of the "natural resource curse" phenomena. Hnatkovska & Loayza (2003) found that this negative link is not only statistically but also economically significant. They argued that negative link becomes stronger for poor countries with underdeveloped institutions, low financial development, and countries that are unable to conduct countercyclical fiscal policies. Some oil exporting countries (Kuwait, Saudi Arabia Qatar, and Iran) registered negative growth rates for two consecutive decades and very high volatility. UAE had a negative average growth rate for four consecutive decades with the volatility of 6.10 in output. After controlling for simultaneous and reverse causality in the

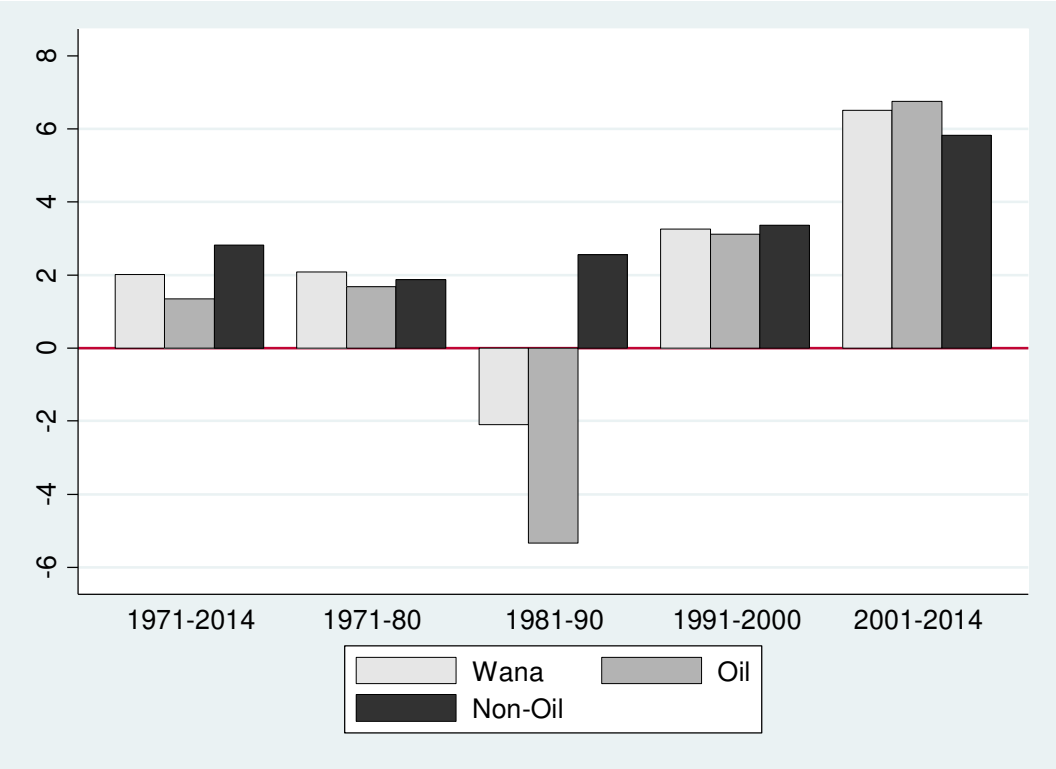
volatility and growth relation (Hnatkovska & Loayza, 2004) estimated that one percent increase in volatility decreases growth by 1.3 percentage points which represent a significant drag on growth. Furthermore, from 1971-2014 the average annual growth performance of resources poor countries such as Egypt, Tunisia, Morocco, Jordan, and Turkey, remained relatively superior and even surpassed the major oil exporters where their average annual growth did not exceed 2 percent (see Figure 2). Figure 2 shows that during the early years of 1980's – a period of steep decline in oil prices- the growth rate of oil producers was negative whereas that of the non-oil producers was positive, the region as a whole registered negative growth rate. It shows that despite substantial heterogeneity among individual countries, the region as a whole display a common trend in regard to growth performance which is very disappointing.

Table 3: Compound Average Annual Growth of GDP per capita

Country	1971-80	1981-90	1991-2000	2001-2014	1971-2014	volatility
Oil-dependent countries						
Bahrain	2.22	-4.62	4.68	4.24	1.58	5.32
Kuwait	-7.62	-8.00	10.06	5.19	-0.08	25.86
Oman	9.40	-2.99	4.04	7.04	4.37	2.58
Qatar	-1.52	-9.42	7.85	7.76	1.31	6.86
Saudi Arabia	2.33	-8.13	-0.65	8.94	-0.28	7.69
UAE	-0.54	-8.24	-0.84	-2.51	-2.79	6.10
Iran	-8.03	-1.64	8.01	4.71	2.95	5.20
Iraq	7.59	-0.92	8.50	12.16	1.18	3.62
Algeria	6.21	-4.64	0.23	4.19	0.67	3.49
Non-oil dependent countries						
Turkey	1.88	2.84	2.07	5.27	2.10	2.06
Tunisia	4.77	2.06	4.59	2.52	3.16	1.19
Egypt	2.58	2.73	8.88	7.37	6.01	1.12
Jordan	4.36	0.33	1.04	10.25	2.62	2.61
Morocco	3.36	5.23	0.79	5.07	2.78	1.68
Syria	-5.60	-5.66	3.46	6.51	0.98	8.87
WANA	2.09	-2.09	3.26	6.51	2.01	2.36
Oil	1.69	-5.34	3.12	6.76	1.35	3.88
Non-Oil	1.88	2.56	3.36	5.83	2.82	1.40

Source: Penn World Tables (9.0) and authors own calculations.

Figure 2:Annual Growth Rate of Per Capita GDP



4.3 Growth Accounting

In this section growth accounting exercise has been conducted to shed some light on the contribution of various production factors to economic growth. As section 1 shows that WANA countries are prone to high volatility in growth pattern, it is, therefore, crucial to identify the various sources of growth, basically to account for this volatile growth record. Most countries of the region are dependent on oil revenues to fuel their growth. The fluctuations in the international energy market directly or indirectly affect the growth prospects of the economies of the WANA region. Understanding the sources of growth and their relative contribution is, therefore, critical for designing policies for sustaining growth.

The basic idea of growth accounting is to divide the growth of output into the growth of factor inputs and factor productivity. The latter captures the efficiency with which factor inputs are used in the production process. Solow (1957) conducted apioneering analysis of the long-term growth and productivity. Assuming neoclassical growth theory with two factors of production, labour and capital, Solow argued that, for the US, a major part of the growth in output was not explained by these two input factors. The unexplained part was attributed to improvement in efficiency of these inputs, commonly known as Total Factor Productivity (TFP). TFP is determined by technical change or how efficiently or intensively the factor inputs are utilized in the production function. One of the fundamental predictions of (Solow, 1957) model is that the long-run growth is sustained by continuous improvement in TFP. Thereafter, literature flourished vastly to empirically estimate the sources of growth. Mankiw, Romer, & Weil (1992) argued that augmented Solow model accounts for over 80 percent of cross-country

variation in income per capita. However, (Young, 1995) and many recent studies argued that growth miracles of Asian Tigers (Hong Kong, Singapore, South Korea, Taiwan) were largely due to a substantial increase in measured factor inputs.

Table 4: Growth Accounting for Selected Countries

country	Output growth	Contribution from			
		Labour	Capital	Human capital	TFP
Oil-dependent countries					
Bahrain	4.02	1.89	4.10	0.43	-2.42
Kuwait	0.13	1.14	3.28	0.21	-4.62
Qatar	6.29	2.12	5.14	0.38	-1.46
Saudi Arabia	3.24	1.54	2.49	0.38	-1.19
Iran	2.04	0.98	3.26	0.53	-2.78
Iraq	5.41	0.60	2.60	0.27	1.69
Non-oil dependent countries					
Turkey	4.06	0.86	2.53	0.70	-0.04
Tunisia	4.54	1.20	2.02	0.91	0.39
Egypt	5.35	1.01	3.99	0.67	-0.34
Jordan	4.42	1.94	3.19	0.80	-1.53
Morocco	3.92	1.52	2.32	0.62	-0.58
WANA	3.68	1.04	2.93	0.54	-0.83
Oil	3.19	0.99	3.08	0.37	-1.29
Non-oil	4.60	1.21	2.70	0.68	-0.14
Comparators					
India	5.37	1.50	2.13	0.78	0.96
China	6.57	1.22	3.42	0.79	1.14
Brazil	3.76	1.35	2.08	0.72	-0.39
Singapore	6.82	1.59	4.32	0.75	0.14
Japan	2.48	0.27	2.51	0.35	-0.65

Source: Penn World Tables (9.0) and authors own calculations.

Table 3 and Figure 4 reports growth accounting estimates for selected WANA countries[14] for the 1971-2014 period. The results are derived from Equation (4) in section 1. In the table, the growth rate of real GDP is decomposed between contributions from the growth rates of labour, human capital, and physical capital. Our first observation is that is that TFP growth rates are negative for all countries except Iraq and Tunisia. In the case of Iraq, TFP contributes 1.69 percent of the compound annual growth of 5.41 percent (about 31 percent) in GDP, while for Tunisia TFP contributes 0.09 percent of the compound annual growth of 4.54 percent (about 1.9 percent) in GDP. WANA region registered negative TFP growth over time in comparison to benchmark countries (see Table 3, comparators). It gives an indication of lower production efficiency. Decreasing TFP is the major factor in the sluggish growth performance of GDP.

[14] Necessary data for growth accounting on remaining countries under consideration namely Oman, UAE, Algeria and Syria was not available and has been left out of analysis in growth accounting.

These findings are in line with (Makdisi, Fattah, & Limam, 2007) (Abu-Qarn & Abu-Bader, 2007).

Figure 3: GDP Growth Rate Decomposition (1971-2014)

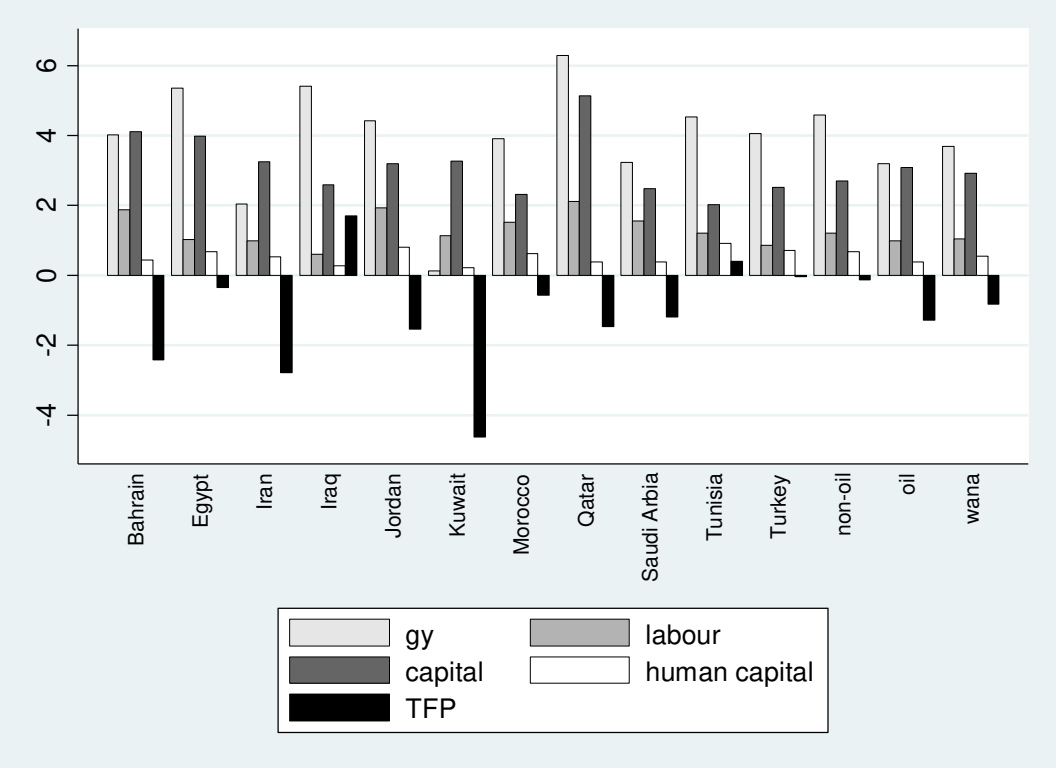


Table 4 shows that for the entire period (1971-2014), the contribution of human capital to the GDP growth is steady. Non-oil producing countries have shown improvements in human capital which augmented GDP growth. Our findings point out that labour and capital are the dominant factors of growth followed by human capital. TFP does not seem to play any significant role; rather it is detrimental to WANA countries' growth performance. However, one important point which needs to be highlighted here is that TFP is a residual measure embodies other factors affecting growth which are not included in labour, physical capital and human capital. Makdisi, et al. (2007) regressed TFP growth on a series of relevant variables to assess their relative contribution. The main repressors' were the quality of institutions, inflation rate, the initial income, initial primary enrolment rate in primary school, index of natural resource abundance. At low values of capital share, the results indicated that institutions and stock of human capital have positive effects on TFP growth. Inflation rate and natural resource abundance had a negative influence on productivity. However, initial income with negative sign points catching –up effect on productivity. With a higher value of the capital share, only initial income and human capital remained statistically significant. All these empirical findings emphasize adoption of policies that will lead to improvement in productivity growth.[15]

[15] See (Bisat, El-Erian, & Helbling, 1997) has highlighted various policy measures for achieving high and sustained growth in Arab countries.

4.4 Convergence

As Table 1 shows that there are large differences in per capita GDP and growth rates (Table 2) across countries in the WANA region. Therefore it is pertinent to test whether this cross-country difference decreased or increased over time. Alternatively, we can say that whether there is any sort of convergence or catching-up among various countries in the region. Following (Sala-i-Martin, 1996) we discuss two types of convergence namely β-convergence and δ-convergence. The hypothesis that poor countries tend to grow faster than rich countries in terms of per capita income – without conditioning on country-specific variables- is referred to as absolute β-convergence. Accordingly, we expect a negative relationship between per capita income and its growth rate.

If the dispersion at time *t* is smaller than an initial period, we can say that there exists σ-convergence. On the other hand, divergence implies an increase in dispersion across countries over time. We can also calculate the *coefficient of variation* as an alternative way to estimate σ-convergence. Accordingly, a decreasing (increasing) value of the coefficient of variation over time implies convergence (divergence). It should be noted that these two concepts of convergence are closely related to one another. In fact, we could find σ-convergence only if β-convergence holds true. We could find β-convergence without finding δ-convergence. Thus, a necessary condition for σ-convergence is the existence of β-convergence (Sala-i-Martin, 1996).

Figure 4 displays the dispersion-measured as the coefficient of variation- of per capita GDP across WANA countries and over the time period of 1971-2014. The figure portrays a clearly declining trend in cross county dispersion of income over time. The dispersion declined from 1.83 in 1971 to 1.52 in 1974. Thereafter, it rises to 1.88 in 1980 followed by a continuous decline. For the overall period, we found the standard deviation of per capita income to be less than one (0.61), therefore we accept the hypothesis of δ-convergence at five percent level of significance. R^2 is 80 percent.

Figure 4: Dispersion of Income across WANA Countries, 1971-2014

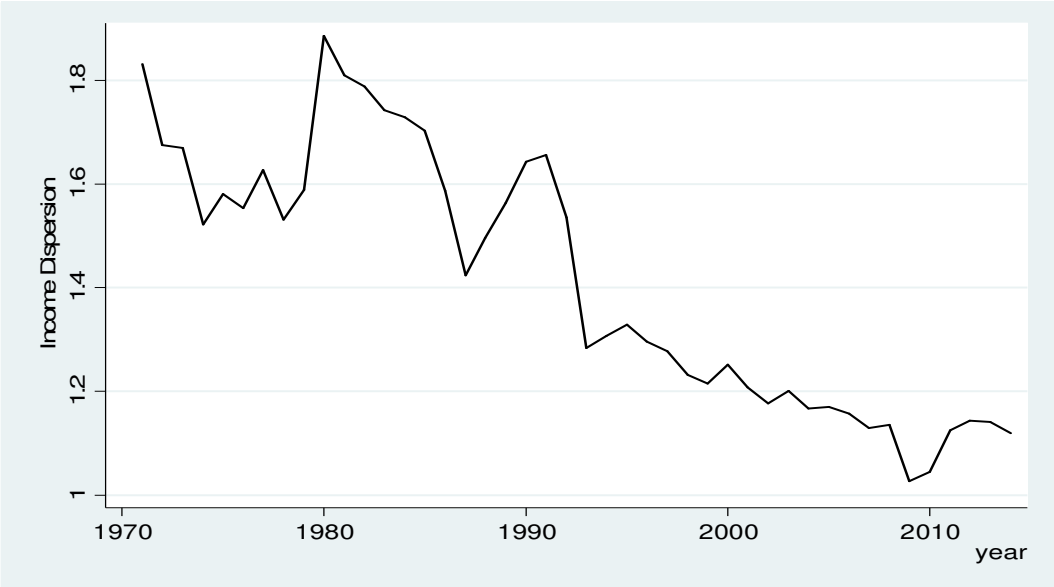


Table 5: Estimation of the σ-convergence

	Coefficients	***t-Statistic***	***P-value***
Intercept	36.15	13.31*	0.00
time	-0.018	-12.79*	0.00
R Square			0.795

*5% level of significance

Table 5 and Figure 5 displays the average growth rate of per capita income or GDP for each country from 1971-2014 against the log of per capita GDP in 1971. The cross-country variation in growth rates is very clear from the statistics reported in the table. A visual inspection of the table reveals that the hypothesis of absolute β-convergence holds true in our study. As the countries that were rich in 1971, for example, UAE, Qatar, Kuwait, registered slow even negative growth rates over the time period. On the other hand initially poor countries, for example, Egypt, Morocco, Jordan grow rapidly over time. Table 6 reports the estimation results of absolute β-convergence. The hypothesis of absolute β-convergence hold true for our dataset since β has a negative and significant value of -0.10, R^2 is 72 percent.

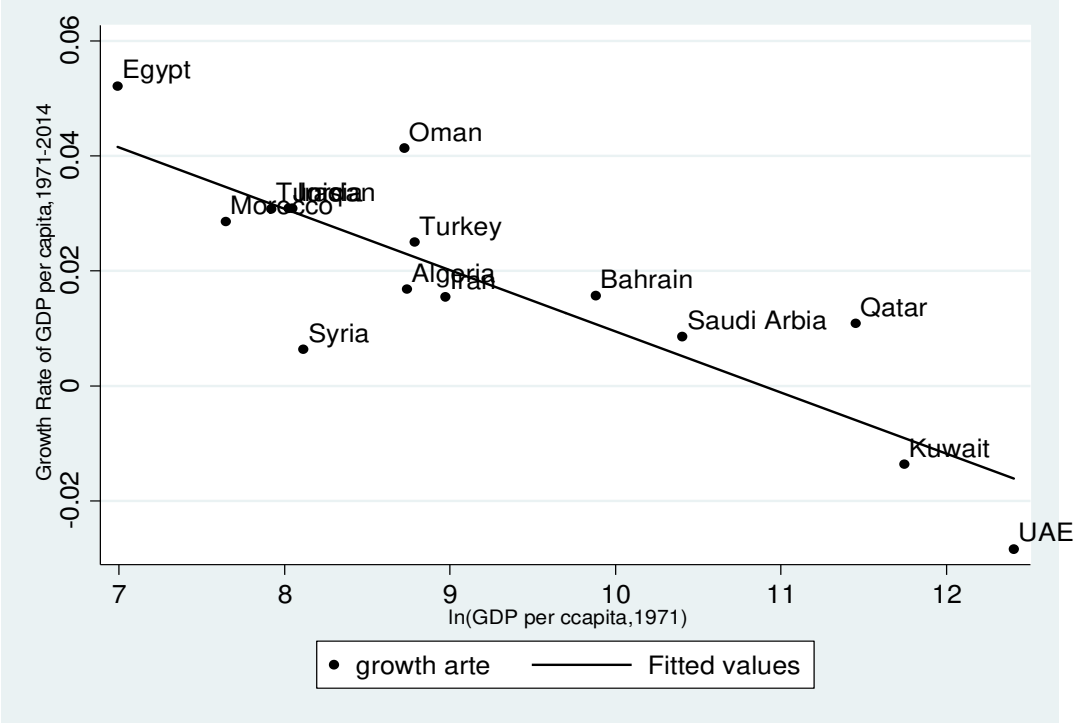
Table 6 Estimation of β-convergence (Dependent variable is Growth rate)

	Coefficients		**t-Statistic**	**P-value**
Intercept	0.116121		6.893712*	0.00
ln(GDP pc,1971)	-0.01066		-5.90211*	0.00
R Square				0.728

*5% level of significance

Again figure 5 shows that the relationship between growth rate and initial level of per capita GDP is negative.

Figure 5: Convergence of Per Capita GDP across Countries



These results show that absolute β-convergence and δ-convergence holds true in case of our sample countries, implying that initially poorer countries grow more rapidly than rich ones and dispersion in per capita income decreased over the sample period of 1971-2014.

5. Conclusions

We tried to understand long-run growth dynamics of West Asian and North African Region during 1970 to 2014. Specifically, the study focuses on three issues: temporal and spatial variability of economic growth, the convergence of income and role of total factor productivity. Our findings suggest that oil-dependent economies have shown large variations in growth which can be linked with the fluctuations of oil price. Due to rapid population and labour force growth (both nationals and immigrants) in most of the oil-based economies, growth rates of per capita GDP and per worker GDP are quite meagre. It is found that economic performance of non-oil countries is dependent upon oil countries. Total factor productivity does not play a significant role and growth in the region is due to the capital accumulation. Our findings point out that labour and capital are the dominant factors of growth followed by human capital. TFP does not seem to play any significant role. Both beta and sigma measures of convergence suggest that there is convergence in per capita GDP.

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