# Measurement of the Public Sector Efficiency and Performance in Mena Region via Composite Index Approach

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## Abstract

*Interest for the public sector performance and efficiency has considerably grown. Their measurement is an important feature since they are connected to the public budget and their rational use. Our paper slot into this interest for North African and Middle East countries commonly known as MENA region where recent contests against absolute political regimes, human right violation, political corruption, an overtime economic decline and high unemployment rate especially within the youth suggest the failure of their public sector to fulfill its basic functions shared into first, opportunity functions which reflect the quality of the administrative, education, health and the infrastructure and second, Musgravian functions such as the stabilization of the economy, assessing the overall economic performance and an efficient distribution of wealth.*

*Reaching the objective mentioned above, composite indicator approach has been applied to capture the level of public sector performance and efficiency and data envelopment analysis DEA to capture their technical inefficiency for the first time in a sample of MENA countries. Our results suggest that they do not much derive from results obtained in identical previous studies for new EU members and emergent markets countries.*

**Key words:**  public sector, efficiency, performance, technical efficiency, MENA region.

**JEL Classification:** D61, H11, I32, I38

## 1 Introduction

One of the noticeable recent events in the MENA region was the growing protests commonly named the Arab spring. Arab spring has been instigated by the dissatisfaction with the rule of local governments through that wide gaps in income levels may have had a hand as well. Numerous factors have led to the protest including issues such as dictatorship or absolute monarchy, human right violation, political corruption economic decline, unemployment especially within the youth, extreme poverty and a number of demographic factors such as a large percentage of educated but dissatisfied youth within the population. Protests in major MENA countries have included the refusal of the concentration of the wealth in the hands of the rulers in power for decades, insufficient transparency of its distribution and bad institutional and judiciary quality. The compilation of protest reasons may be summarized in one sentence; the public sector failure to accomplish its basic microeconomics, macroeconomics and non-economic functions including the distribution of wealth, the stabilization of the overall economy and the use of budgetary policy as a mean to maintain high level of employment, price stability and the economic growth. The ways those functions are concreted should depend from the public choice

and their results are subject to the public control. So following this reasoning, questions should be asked. Does the public sector in MENA countries failed to fulfill its basic functions? In this case which functions of the public sector are relevant to measure it´s performance and efficiency? Do the natural resources help to assess the quality of the public sector in MENA countries or quite the reverse weakened the quality of the public sector?

The aim of this paper is to measure the performance and then the efficiency of the public sector in MENA region in ante-revolutionary period (2001-2011) using composite indicators of the public sector as compiled by (Afonso, 2006) the final result will be a ranking of MENA countries in term of their performance and efficiency.

For answering our questions the paper is shared into five sections; the first one is dedicated to conceptually define efficiency effectiveness and overall performance, when the second section mainly theoretical assesses the used approaches for technical efficiency measurement. The section three analyses the characteristics of MENA region and its respective public sector. The fourth section discussed the used data and methodology when the last section is dedicated to results and their commentary.

## 2 Efficiency, Effectiveness and Performance of the Public Sector and Their Measurement

In both profit and non-profit organizations, efficiency and effectiveness are the central terms in assessing and measuring their performance (Mandl, 2008; Hájek, Stejskal, 2014). However, there is confusion in determining the conceptual meaning of what does effectiveness, efficiency and then the overall performance mean.
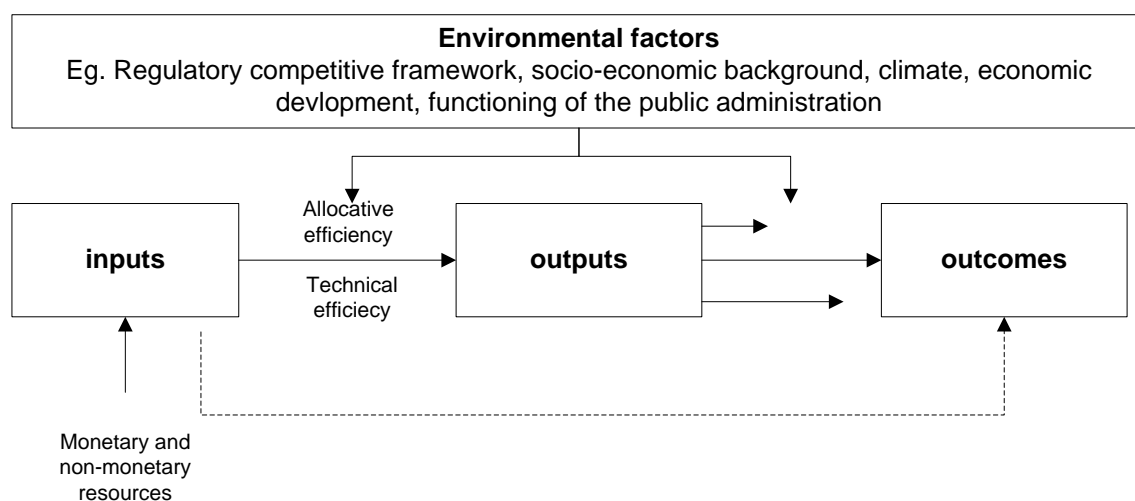


**Fig. 1 Conceptual framework for efficiency and effectiveness**
Source: Mandl, 2008

Figure 1 depicts input, output and outcomes. Inputs consist on monetary and non-monetary resources used in the public sector to produce an output (e.g. health expenditure affects the health care system) consequently the input-output ratio is the basic measure of efficiency.

Efficiency of an organization is also concerned with minimizing the cost and deal with the allocation of resources across alternative uses. A public sector attaining efficiency may be traduced by the following pathways as advised by (Kearney, 1999):

- Greater services are provided with lower costs,
- Constant services are provided using lower costs,
- Greater services with constant costs,
- Greater increase in services realized through higher costs,
- Smaller decrease in services through lower costs.

Efficiency can be perceived as technical and allocative; the technical efficiency implies a relation between inputs and outputs in the frontier production curve, its measurement consists on the extent to which an organization allocate efficiently the physical input and its disposal for a given level of outputs. Whereas, the allocative efficiency measures the extent to which inefficiency incurs, because an organization is using the wrong combination of inputs in term of purchasing costs.

In the other side, the measure of effectiveness assesses the ability of an organization to attain the predetermined goal and objectives as observed by (Keh, 2006; Merickova Mikusova, Stejskal, 2014). By other mean, an organization is effective to the degree to which their goals are achieved. Following the figure 1 effectiveness relates the input or the output to the final objective to be achieves i.e. the outcome. The latter is often linked to welfare or growth objectives and may be influenced by several factors including output and exogenous environmental factors.[1] (Mandl, 2008) Observed that effectiveness of an organization/ public sector is difficult to assess comparing to it efficiency since the outcomes are affected by the political choices and are affected by the environmental factors which may or not within the control of the policy maker.

Efficiency and effectiveness are the two mutually exclusive components of the overall performance measure yet they may influence each other more specifically; effectiveness can be affected by efficiency or can have an impact on efficiency as well as have an impact in overall performance (Kumar, 2010).

Methods for measuring efficiency and effectiveness of the public sector and then the overall performance have a common point how to calculate and measure the sharp of the efficiency frontier (Keh, 2006) and this may be possible by using both parametric and non-parametric methods.

Parametric methods are based on parametric frontier functions (Cobb- Douglas, Translog, ext.) which require the ex-ante definition of the functional form of the efficiency frontier also named *"regression based estimators."* Its parameters are estimated by statistical or other methods in such a way that a graph of the function enveloping the data from above. Then, the efficiency of each observation is computed in terms of the distance between the observation and the graph of the estimated function. Under parametrical methods we can meet the *Corrected Ordinary Least*

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[1] The environmental factors are known as the regulatory competitive Framework, socio-economic background, climate, economic development and the functioning of the public administration

*square* (COLS) where the production function is first estimated using ordinary least square (OLS), the OLS intercept parameter is then shifted up by the value of the largest positive residual in order to establish the frontier. (COLS) was applied by (Metha, Giertz, 1996) to measure the performance of the property tax assess process. The second method consists on the *Thick Frontier Approach* (TFA) developed by (Berger, Humphrey, 1991). The method begins with sorting the data on the average costs then it proceeds with the estimation of the two think frontiers one for the lowest and one for the highest average costs quartile. Average inefficiency of the highest quartile is then computed by comparison of the two thick frontiers. The TFA method was used by (Akhavein, Swamy and Taubman, 1994) to evaluate the financial services industry.

In the other hand, under the non-parametric models we order the *Stochastic Frontier Estimation (SFE)* the most widely used method based on statistical and econometrical methods and on a specific functional form for the relationship between input and output. The approach is in sum laudable because is able to cover the effects of exogenous shocks, i.e. non-discretionary factors (Mandl, 2008). The method was applied by several scholars to assess first, the economic efficiency of the public sector education organisations (Emre, 2013). Second, for estimating public library efficiency (Hemmeter, 2006) and to measure and explain the efficiency in improving health and education indicators (Ruwan, Quentin, 2003). The second known method is the *Full Disposal Hull (FDH)* initially used by Deprins et al. 1984 the FDH is a non-parametric approach for efficiency frontier´s construction using data input/output for the whole simple following mathematical programming methods (Aristovnik, 2009) then the efficiency provides a benchmark. The FDH is primary data-driven and follow a stepwise approach to construct the efficiency frontier one can observe the highest possible level of output/outcome for a given level of output. The method was also used by (Ebejer, Mandl, 2009) to measure the public expenditure efficiency in Malta. Finally, the last method is the *Data Envelopment Analysis (DEA)* which is recently used to measure the efficiency of the public spending based on linear combination of input and output to specify the efficiency frontier. The convexity of the set of input/output combination is assumed since the method constructs an envelope around the observed combination. This method was used by (Afonso, 2006) for the measurement of the public spending efficiency across a sample of emergent and new EU members; the general relationship can be given by the following function for each country:

$$y_i = f(x_i) \; i = 1...n \tag{1}$$

Where $y_i$ is a composite indicators reflecting output measure $x_i$ relevant aggregate spending or other relevant inputs in countries $i$ and $i = 1....n$

In the case of $y_i < f(x_i)$ it said that country $i$ exhibit inefficiency. For the observed input level the actual output is smaller than the best attainable one and inefficiency can then be measured by computing the distance to the theoretical efficiency frontier in two ways; output efficiency oriented or output efficiency oriented. Countries then are ranked according to their distance from the possibility frontier.

The DEA method will be applied in order to rank our sample of MENA countries.  It is noticeable that the use of DEA method gives an overview about the ranking of our data set units to capture their technical efficiency. The main advantages to this method are the ability to accommodate the multiplicity of inputs and outputs. Furthermore, DEA method also focuses on revealed best practice frontiers rather than on central tendency properties. However, the only one

grief is that the method is relative i.e. dependent from the data set (e.g. in case we add or delete one unit the result and the ranking changes).

## 3 Middle East and North Africa Region and its Characteristics

MENA region covers an extensive region extending from Morocco to Iran including the majority of both Middle East and Maghreb countries. Mena has no standardized definition; the extent of the region depends on different organizations´ interpretations. The following list commonly includes countries and territories as following: Algeria, Bahrain, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Yemen, United Arab Emirates, Libya, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Syrian and Tunisia. In broader definition includes sometimes Armenia, Azerbaijan, Cyprus, Djibouti, Mauritania, Somalia, Sudan, Turkey, and Western Sahara. In April 2013 the IMF included Pakistan and Afghanistan to MENA region given the new term MENAP (IMF, 2012). MENA region includes a total population of 381 million people which represent the 1/6 of total world population. At its greatest extent of MENA, the population is about 523 million of inhabitants (IMF, 2013). MENA region is often associated to the Arab World some organizations cluster the region into three main sub-regions the first one is North Africa (Morocco, Algeria, Tunisia Libya and Egypt), the Levantine (Palestine, Israel, Lebanon, Jordan and Syria) and the gulf countries (Iraq, Kuwait, Saudi Arabia, Yemen, Oman, Qatar, United Arabic Emirates and Bahrain). The first classification answers as well the cultural specificities of the region. In the other side, and by regard to the economic point of view, MENA region can be clustered according to two main characteristics, the existence or not of local abundant labor force and the existence or not of natural resources such as oil and gas, the following classification is depicted in the following table.

**Tab. 1 MENA countries clustering under the existence of two factors**

|                              |     | Natural Resources | |
| :---                         | :---: | :---: | :---: |
|                              |     | **YES** | **NO** |
| Labor Force abundant countries | **YES** | Algeria, Iran, Iraq, Azerbaijan | Jordan, Egypt, Israel, Lebanon, Tunisia, Turkey, Morocco, Yemen |
|                              | **NO**  | Bahrain, Kuwait, UAE, Libya, Oman, Qatar, Saudi Arabia | Not defined |

Source: O´Sullivan et al. 2011

It is noticeable that countries with natural resources represent respectively 60 % and 40 % (IMF,2012) of the world share in oil and gas reserves, countries with natural resources are also clustered under their revenues (GDP per capita) into two main groups; the first one includes countries with higher incomes mainly Bahrain, Kuwait, UAE, Libya, Qatar, Saudi Arabia. The second group is known to be upper middle income and contains Algeria Iran, Iraq, and Azerbaijan. According to this clustering we developed our assumption that countries rich in natural resources will have best performance in their respective public sector because the bulk of their revenues generated by the export of their natural resources make easy the financing of their public projects and impact positively in their public sector performance. However, countries without natural resources have hurdles to finance growing needs for public sector goods and

services. Although this the MENA region represent an interesting case study because regrouping countries with different level of potentialities.

One of the characteristics of the public sector in MENA countries is the relative small size of government as shown in figure 2; although the economic ease of almost all countries their expenditure fall under the line of 40 % of their total GDP. At the same time it is noticeable that the public sector in MENA countries is the first employer; in 2005 it contributes to 29% of the total employment much higher than in Japan 7.7 % the USA 14.6% and the UK 18.9% public sector employment is as high as 93% in Kuwait, 79% in Saudi Arabia, 66% in Libya (Al Masah, 2011)
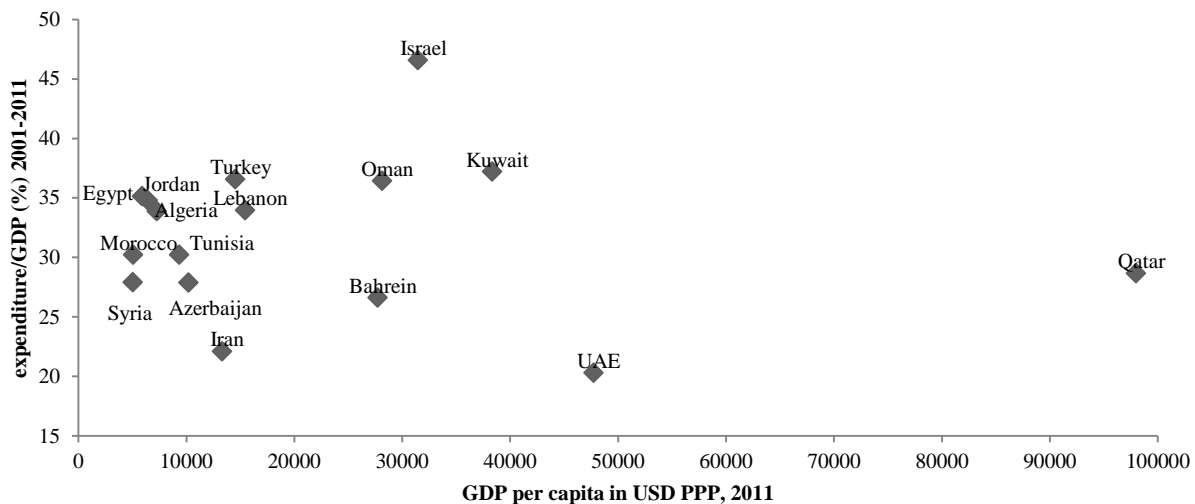


**Fig. 2 The size of the government and GDP per capita**
Source: own compilation according to WDI database

## 4 Data and Methodology

Our method for constructing the inputs and output is based on composite selected indicators; the method is borrowed from the work of (Afonso, 2006) for the measurement of the performance and the efficiency of the public sector in new EU members and emerging markets. In its first step, the method measures the performance of the public sector using two clusters of indicators named first, opportunity indicators and second, Musgravian indicators as depicted in the Figure 3.

The cluster of opportunity indicators aggregates four main indicators which are: Administrative, education, health, and infrastructure. Each indicator is the result at least of one sub indicator, for administrative (corruption, red tape, quality of judiciary, shadow economy). For education the performance is captured through the quality of math and science and the second school enrolment. The performance of health system is captured through the infant survival at birth and life expectancy and finally the performance of infrastructure expressed by the quality of communication and infrastructure. Then, a good public administration and high human capital enhanced by a good level of health care and educational systems and a sound infrastructure can be a perquisite for a well functioning market where the rule of law is applied and opportunities are open for all citizens.

For the Musgravian indicators which capture the basic functions of the public sector are expressed on the ability of the latter for distributing, stabilizing, and improvement of the overall economy. The distribution is captured by the Gini coefficient, stability through two main sub-indicators respectively the ten-years´ average of the overall inflation and the stability of the GDP growth through its coefficient of variation. Then the overall economic performance is captured via two sub-indicators which are the ten-years´ average of unemployment and the GDP real growth. It is important to mention that this group of indicators illustrate the achievement of the stabilization objectives and the allocative efficiency by economic performance.

Sub-indicators will be averaged and aggregated into the relevant indicator. Finally all sub-indicators are used to compute a composite public sector performance by given them an equal weights. The values are normalized and the average is set equal to one.
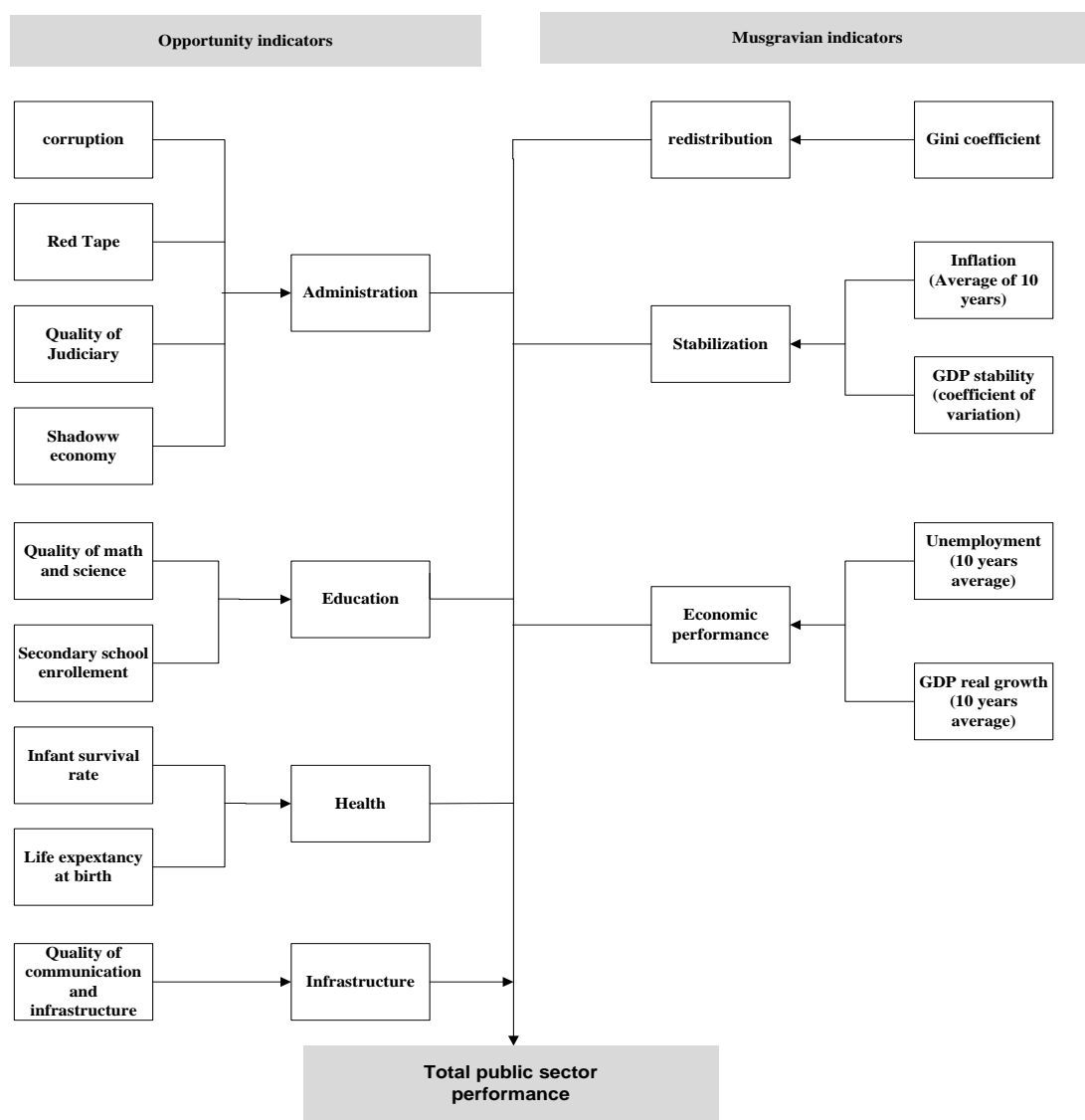


**Fig. 3 Total public sector Performance (PSP) indicators**
Source: Afonso, 2006

Then the PSP of each country is related to this average and derivations from this average provide an indication of the public sector performance for each country.

The measurement of the overall public sector performance is based on the improvement of economic and social indicators *(I)* for *i* countries and *j* areas of government performance. This is mathematically traduced into the following equation:

$$PSP = \sum_{i=1}^{n} PSPij \tag{2}$$

$$PSP = f(Ik) \tag{3}$$

Then, the enhancement of the public sector performance will be with the improvement of the economic and the social indicators as following:

$$\Delta PSP \sum_{i=k}^{n} \frac{\delta f}{\delta Ik} \Delta Ik \tag{4}$$

And because the level of public sector performance explained above do not take into consideration the level of the public spending dedicated for their realization. Then, the *PSP* will be weighted by the relevant category of public spending. This introduce to the public sector efficiency *PSE* mathematically expressed as:

$$PSE = \frac{PSPi}{PEXi} \tag{5}$$

$$\frac{PSPi}{PEXi} = \sum_{i=1}^{n} \frac{PSPij}{PEXij} \tag{6}$$

Where *PEX_i* is the relevant category of public spending for each indicator computed into both opportunity and Musgravian indicators the input measure for opportunity indicators are:
   1. Public consumption as proxy for input to administrative outcomes;
   2. Expenditure on health for health care system performance;
   3. Education expenditure for education performance;
   4. Public investment for infrastructure.

And the inputs for the Musgravian indicators are:
   1. Transfer and subsidies as a proxy for the income distribution;
   2. Total spending for the overall economic stabilization;
   3. Total expenditure for economic efficiency.

Finally the last step will assess the distance between the possibility frontier created by the most performer countries and the distance between this frontier and the rest of the sample of MENA countries which are above the curve using DEA method.

## 5 Results

The calculation of the PSP using the composite indicators and sub indicators of our sample gives the following results where the primary data and its calculation are explained in appendix 1.

**Tab. 2 Public sector Performance (PSP) indicators (2001-2011)**

| countries | Opportunity indicators | | | | Musgravian indicators | | | Total public sector performance |
|---|---|---|---|---|---|---|---|---|
| | Administration | Education | Health | Infrastructure | Distribution | Stability | Economic performance | |
| Algeria | 0.71 | 0.91 | 0.98 | 0.81 | 1.00 | 1.07 | 0.86 | 0.91 |
| Azerbaijan | 0.91 | 1.01 | 0.98 | 0.94 | 1.03 | 0.60 | 1.11 | 0.94 |
| Bahrain | 1.16 | 1.04 | 1.03 | 1.19 | 1.00 | 1.95 | 0.98 | 1.19** |
| Egypt | 0.89 | 0.79 | 0.98 | 0.92 | 1.08 | 0.96 | 0.69 | 0.90 |
| Iran | 0.87 | 1.01 | 1.00 | 0.85 | 1.12 | 0.76 | 0.88 | 0.93 |
| Israel | 1.20 | 0.94 | 1.07 | 1.05 | 1.01 | 1.20 | 0.93 | 1.06 |
| Jordan | 1.09 | 1.04 | 1.00 | 1.11 | 1.01 | 1.19 | 0.89 | 1.05 |
| Kuwait | 1.03 | 0.94 | 1.01 | 1.05 | 1.00 | 0.75 | 0.90 | 0.95 |
| Lebanon | 0.77 | 1.14 | 0.83 | 0.53 | 1.00 | 1.00 | 1.52 | 0.97 |
| Morocco | 0.88 | 0.80 | 0.98 | 0.87 | 0.92 | 1.86 | 0.70 | 1.00 |
| Oman | 1.19 | 1.01 | 1.03 | 1.24 | 1.00 | 1.02 | 0.97 | 1.07 |
| Qatar | 1.28 | 1.25 | 1.04 | 1.09 | 0.92 | 0.91 | 2.22 | 1.24*** |
| Syria | 0.75 | 0.90 | 1.01 | 0.77 | 1.00 | 0.77 | 0.62 | 0.83 |
| Tunisia | 1.12 | 1.20 | 1.01 | 1.17 | 1.00 | 1.01 | 0.80 | 1.04 |
| Turkey | 0.88 | 0.88 | 1.01 | 1.09 | 0.93 | 0.34 | 0.82 | 0.85 |
| UAE | 1.27 | 1.13 | 1.03 | 1.32 | 1.00 | 0.62 | 1.12 | 1.07* |
| Average | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| New EU countries[1] | 0.99 | 1.06 | 1.00 | - | 1.09 | 0.74 | 0.86 | 0.96 |
| Asian NIC[2] | 1.11 | 1.00 | 1.00 | - | 0.93 | 1.76 | 1.44 | 1.21 |

Each sub- indicator contributes 1/7 to total indicator

[1] and [2] results from the study of (Afonso, 2006) same method for the period of (2001-2003)

Source: own compilation

When ordering MENA countries from the most to the least performer the result is somehow different from our first assumption which tell that countries with natural resources will be ranked as the best performer. When comparing our results with those obtained by (Afonso, 2006), ten MENA countries fall upper the average of new EU member and only one (Qatar) upper the average of Asian NIC. Countries ranking is summarized in the table 3.

**Tab. 3 MENA´s ranking under performance indicators**

| countries | PSP | ranking |
|---|---|---|
| Qatar | 1.242609464 | 1 |
| Bahrain | 1.193403551 | 2 |
| UAE | 1.07003145 | 3 |
| Oman | 1.065422213 | 4 |
| Israel | 1.055659708 | 5 |
| Jordan | 1.045188715 | 6 |
| Tunisia | 1.04427186 | 7 |
| Morocco | 1.002456514 | 8 |
| Lebanon | 0.970771659 | 9 |
| Kuwait | 0.95297495 | 10 |
| Azerbaijan | 0.938698167 | 11 |
| Iran | 0.929026898 | 12 |
| Algeria | 0.905599554 | 13 |
| Egypt | 0.90058848 | 14 |
| Turkey | 0.850953029 | 15 |
| Syria | 0.832343788 | 16 |

Source: own compilation

Composite indicators for the performance of the public sector ranks our MENA´s country sample into four groups respecting the classification of MENA countries according to the availability of hydrocarbon resources and the size of their native population as a labour force. Some commentaries should be done about this ranking. The First group refers to countries rich in natural resources considered as high incomes countries according to the measure of their income per capita such as Qatar, Bahrain, UAE and Oman. This result can be explained by two facts; countries belonging to this group are extremely comfortable because of the high revenues generated by their hydrocarbon commodities in the previous decade and this created a strong macroeconomic stability. Their revenues 88%, 81%, 41%, and 73% (IMF, 2012) and this fact counterbalanced some inverse effects of the other indicators. Furthermore, some reforms were observed concerning their institutions and the level of corruption is the lowest in all MENA´s region. The second fact is connected to their respective population which does not cross 10 million (IMF, 2012) and the extent of their territory is not that large to weight down the provision of public goods and services. The second cluster regroups Israel, Jordan, Tunisia, Morocco, and Lebanon. Group of countries without natural resources and abundant labour force and may be considered as the most performer because their public sector is exclusively not financed by the rent emanating from the export of primary commodities. This group of countries assesses positively their institutional framework and the quality of their human capital (education and health) these positive results were unfortunately counterbalanced by the world economic crisis and the high price of hydrocarbons which affects their macroeconomic stability. The third stratification is composed exclusively from countries rich in natural resources and instead of Kuwait having abundant labour force. The latter belong to the third group because of lack results in the educational system and the stability of the economy as for Azerbaijan where the stability of the economy is the second less reliable in our entire sample after Turkey. In the other side, results

for Iran are questionable about the economic performance, the stability of the economy, infrastructure, and administration quality certainly due to an international context of sanctions. Algeria in term of its public sector performance is ranked in the least position in all countries rich in natural resources this result are mainly influenced by the quality of the administration about what is noticeable the high degree of corruption registered in the last decade (the Arab world economic competitiveness report) public institutions in Algeria remain ridden with corruption and excessive red tape, all the indicators are less than one only those concerning distribution and the stability of the economy enhanced by high oil and gas prices in the previous decade. The last group of countries is composed by countries poor in natural resources and rich in labour force and includes Egypt, Turkey, and Syria. For Egypt all the indicator are under one only for distribution the more weak points concern education and the economic performance for Turkey the stability of the economy is relevant to enhance its position among MENA countries. The less reliable points for Syria are the economy performance, the stability of the economy the quality of infrastructure and the administration which is not possible to enhance in term of civil unrest.

When looking at the public expenditure in table 4, the main observation is the huge amount of public investment for our entire countries´ sample.

**Tab. 4 Total public expenditure and relevant expenditure for PSP indicators (% of GDP)**

| Countries/ variables | Total Expenditure | Good and services | Social transfer | Health | Education | Public investment |
|---|---|---|---|---|---|---|
| Algeria | 33.86 | 2.51 | 11.08 | 2.92 | 4.34 | 34.63 |
| Azerbaijan | 27.88 | 1.94 | 7.24 | 4.77 | 2.94 | 30.48 |
| Bahrain | 26.60 | 4.08 | 5.57 | 2.72 | 3.10 | 25.46 |
| Egypt | 34.79 | 2.21 | 10.41 | 2.12 | 4.31 | 18.68 |
| Iran | 22.09 | 2.39 | 6.97 | 2.29 | 4.71 | 34.10 |
| Israel | 46.57 | 11.32 | 13.28 | 4.76 | 6.18 | 18.91 |
| Jordan | 35.14 | 3.47 | 7.69 | 5.14 | 4.95 | 26.17 |
| Kuwait | 37.20 | 6.61 | 11.76 | 2.30 | 5.62 | 17.41 |
| Lebanon | 33.95 | 0.87 | 8.36 | 3.13 | 2.29 | 25.84 |
| Morocco | 30.21 | 3.19 | 9.01 | 1.71 | 5.57 | 31.27 |
| Oman | 36.43 | 16.58 | 2.29 | 2.73 | 4.00 | 23.37 |
| Qatar | 28.64 | 5.90 | 3.30 | 2.17 | 2.30 | 36.75 |
| Syria | 27.90 | 1.18 | 3.42 | 6.21 | 5.15 | 20.95 |
| Tunisia | 30.21 | 1.75 | 10.57 | 3.15 | 6.39 | 24.29 |
| Turkey | 36.56 | 3.91 | 17.56 | 4.16 | 2.89 | 19.36 |
| UAE | 20.28 | 1.28 | 0.92 | 1.77 | 1.11 | 22.62 |
| **min** | 20.28 | 0.87 | 0.92 | 1.71 | 1.11 | 17.41 |
| **max** | 46.57 | 16.58 | 17.56 | 6.21 | 6.39 | 36.75 |
| **average** | 31.77 | 4.33 | 8.09 | 3.25 | 4.12 | 25.64 |

*All the column are the average from 2001 to 2011 data source are from the column 1-5 from the World Bank WDI and the last column is from the International monetary fund WEO*
Source: own compilation

For the total expenditure two countries attract the attention, Israel and Oman with respectively 46.57% and 36.43%. We have to notice that from 2001 to 2011, these two countries dedicated

respectively 7.8% and 10.32 % (WBG, 2014) as a share of their GDP to military expenses, in order to satisfy their military needs the same countries have a large part of their GDP dedicated to the government consumption in goods and services to insure the functioning of their public sector. From the other side, we can predict that these two facts will impact negatively in their public sector efficiency.  Once again the amount of Israel in GDP share is high in social transfers. High level of transfers is also seen in Algeria, Egypt, Kuwait, and the highest level of social transfers is observable in Turkey. Not much share of GDP is dedicated for health and education.

As expected and looking at the results of public sector efficiency (table 5) the result is less ordered comparing to those obtained in public sector performance; countries considered as the best performer such as UAE, Qatar, Bahrain and Oman are also considered as the best efficient with another order; UAE (2.7) is ranked in the first position followed by Qatar (1.7) then Bahrain (1.12).The other countries are spread to other positions as expected, Israel according to its military expenditure is ranked as the least efficient public sector. In the second group of performers only Lebanon and Morocco keep their position. Iran gains six places in term of efficiency, Azerbaijan two places Algeria one place when Kuwait lost four places.

**Tab. 5 Public sector efficiency (PSE) indicators (2001-2011)**

| Countries | Opportunity indicators | | | | Musgravian indicators | | | Total public sector efficiency |
|---|---|---|---|---|---|---|---|---|
| | Administration | Education | Health | Infrastructure | Distribution | Stability | Economic performance | |
| Algeria | 0.28 | 0.87 | 1.09 | 0.02 | 0.73 | 1.00 | 0.80 | 0.69 |
| Azerbaijan | 0.47 | 1.41 | 0.66 | 0.03 | 1.15 | 0.68 | 1.27 | 0.81 |
| Bahrain | 0.28 | 1.38 | 1.23 | 0.05 | 1.45 | 2.33 | 1.17 | 1.13* |
| Egypt | 0.40 | 0.75 | 1.51 | 0.05 | 0.84 | 0.88 | 0.63 | 0.72 |
| Iran | 0.37 | 0.88 | 1.43 | 0.03 | 1.30 | 1.09 | 1.27 | 0.91 |
| Israel | 0.11 | 0.63 | 0.73 | 0.06 | 0.61 | 0.82 | 0.63 | 0.51 |
| Jordan | 0.31 | 0.86 | 0.63 | 0.04 | 1.06 | 1.07 | 0.80 | 0.68 |
| Kuwait | 0.16 | 0.69 | 1.43 | 0.06 | 0.69 | 0.64 | 0.76 | 0.63 |
| Lebanon | 0.89 | 2.05 | 0.87 | 0.02 | 0.97 | 0.93 | 1.42 | 1.02 |
| Morocco | 0.28 | 0.59 | 1.86 | 0.03 | 0.83 | 1.96 | 0.73 | 0.90 |
| Oman | 0.07 | 1.04 | 1.22 | 0.05 | 3.52 | 0.89 | 0.85 | 1.09 |
| Qatar | 0.22 | 2.23 | 1.56 | 0.03 | 2.25 | 1.01 | 2.46 | 1.39** |
| Syria | 0.64 | 0.72 | 0.53 | 0.04 | 2.36 | 0.88 | 0.71 | 0.84 |
| Tunisia | 0.64 | 0.77 | 1.05 | 0.05 | 0.76 | 1.06 | 0.84 | 0.74 |
| Turkey | 0.23 | 1.26 | 0.79 | 0.06 | 0.43 | 0.29 | 0.71 | 0.54 |
| UAE | 0.99 | 4.19 | 1.89 | 0.06 | 8.80 | 0.97 | 1.75 | 2.67*** |
| Average | 0.40 | 1.27 | 1.16 | 0.04 | 1.73 | 1.03 | 1.05 | 0.95 |
| New EU member | 0.87 | 1.05 | 0.87 | - | 1.04 | 0.64 | 0.77 | 0.84 |
| Asian NIC | 1.63 | 0.95 | 2.16 | - | 1.38 | 3.00 | 2.54 | 1.93 |

*These indicators are the expenditure weighted to capture the indicator of table (2), each sub indicator contributed equally to the total indicator*

Source: own compilation

Comparing the most efficient public sector in MENA countries with those obtained by previous studies the Gulf countries ranked in the fourth first position realized their efficiency in the interval from 2.66 to 1.09 which is in line with results obtained for Chile, Cyprus, Ireland, Korea, Mauritius, and Mexico. MENA countries in average are less efficient than Asian NIC and more efficient than the new EU members and the final results do not much derive from those result obtained in previous studies.

Finally, it is important to mention the ordering of sectors from the less to the most efficient according to their average are: infrastructure (0.04) Administration (0.39) economic stabilization (1.02), economic performance (1.06) health (1.15) education (1.27) and distribution (1.73) which order priorities for an alternative core reforms tending to enhance the efficiency of MENA´s public sector.

The relative efficiency analysis via DEA approach for input oriented allow us to measure the distance between the DMU and the envelope created by the most performers countries (see the figure 4). In other mean how much countries which are under the envelope have to decrease their public spending in order to meet the efficiency frontier envelope.
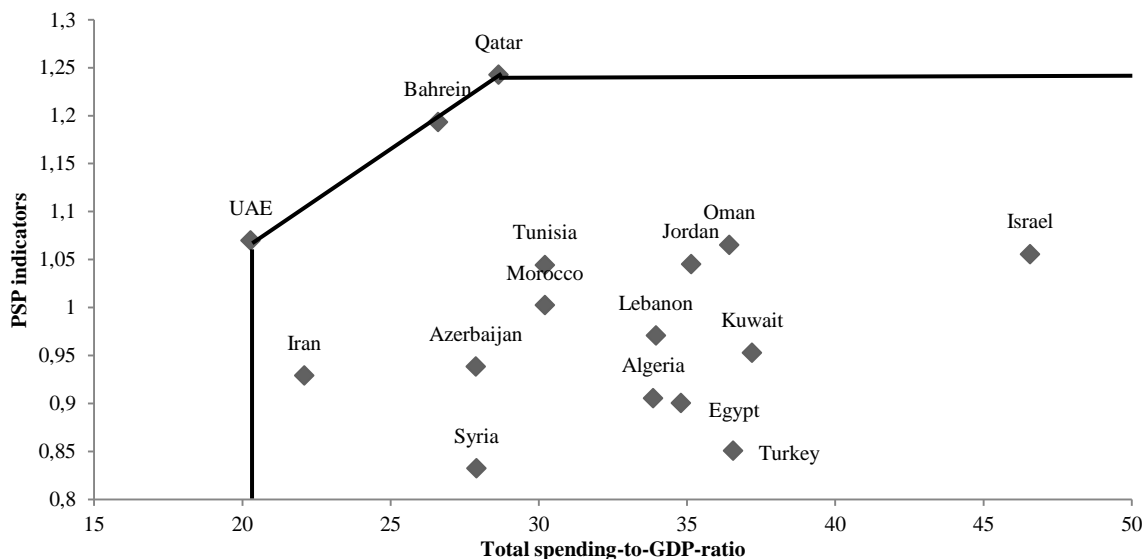


**Fig. 4 Theoretical production possibility frontier, one input one output**
Source: own compilation

As depicted in the figure above the data envelope is constituted by two main countries the UAE (the smallest public sector and the third in term of performance in the entire sample of MENA countries) and Qatar (the best performer in term of public sector and the second in term of efficiency) then the intput-oriented are captured via the variable return to scale (VRS TE) and the constant return to scale (CRS TE) and the results are summarized in the following table.

**Tab. 6 DEA results: one input, one output**

| DMU | VRS TE (input oriented) | rank | CRS TE |
|---|---|---|---|
| Qatar | 1,000 | 1 | 0,822 |
| UAE | 1,000 | 2 | 1,000 |
| Bahrain | 0,987 | 3 | 0,850 |
| Iran | 0,918 | 4 | 0,797 |
| Azerbaijan | 0,727 | 5 | 0,638 |
| Syria | 0,727 | 6 | 0,566 |
| Morocco | 0,672 | 7 | 0,564 |
| Tunisia | 0,671 | 8 | 0,655 |
| Algeria | 0,599 | 9 | 0,507 |
| Lebanon | 0,597 | 10 | 0,542 |
| Egypt | 0,583 | 11 | 0,491 |
| Jordan | 0,577 | 12 | 0,564 |
| Oman | 0,557 | 13 | 0,554 |
| Turkey | 0,555 | 14 | 0,441 |
| Kuwait | 0,545 | 15 | 0,486 |
| Israel | 0,436 | 16 | 0,430 |
| average | 0,697 | | 0,619 |
| min | 0,436 | | 0,430 |
| standard div | 0,182 | | 0,165 |

Source: own compilation

Then Qatar and UAE are considered to be the most efficient in term of technical efficiency followed by Iran and Azerbaijan. Observable is that UAE is using almost the ½ of its inputs to realized the same level of public sector performance as Israel. In the other side, Oman lost many places comparing to the first rankings (performance and efficiency) and this enhance the high level of Oman´s spending dedicated to their military needs the same observation can be done about Israel.

# 6 Conclusions

The aim of this paper was to measure the public sector performance and efficiency in MENA countries in period ante- revolutionary (2001-2011) using composite indicators of the public sector.

The first step consisting in measuring the performance ranked our sample in a perfect stratification according to the availability of natural resources in MENA countries, Gulf countries known as high income ranked as the best performer in term of their public sector followed with a second stratification of countries poor in natural resources with abundant labor force their economic instability caused by the world economic crisis and the high prices of primary commodities was mitigated by their human capital performance. The most unexpected results

concern the third stratification where countries with natural resources were classified as least performer such as Iran, Azerbaijan, Kuwait and the least performer in this group is Algeria.

Assessing the efficiency of public sector ranks MENA countries between Asian NIC countries as the most efficient and New EU countries as the least efficient and results for MENA countries do not much derive from results obtained in these two regions. The only one problematic fact in MENA countries is that their respective public sector is the first employer and is enable to absorb the growing educated young citizens entering to job market. This problematic fact combined with years of authoritarian rule driven by lack of political liberty, endemic corruption and high inflation gave place to social unrest and protests more visible in MENA countries without natural resource such as Tunisia, Egypt, Yemen and Syria where financing such public sector growing is limited.

Then we measured the distance separating the production possibility frontier drawn by two countries UAE and Qatar and we concluded that the most technical efficient country used the ½ of the least efficient country Israel to offer the same level of public goods and service.

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**Appendix 1: Primary data, calculations, and sources**

| countries | TOTAL PUBLIC SECTOR PERFORMANCE | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | OPPORTUNITY INDICATORS | | | | | | | | | MUSGRAVIAN INDICATORS | | | | | |
| | Administration | | | | Education | | health | | Public infrastructure | distribution | stability | | Economic performance | | |
| | corruption | red tape | quality of judiciary | shadow economy | secondary school | education achievement | infant survival at birth | Life expectancy | Quality communication and infrastructure | Income share of 40 % of poorest households | inverse of Stability of | inverse of average | GDP per capita | GDP growth | unemployment |
| Algeria | 3.40 | 2.30 | 2.80 | 3.24 | 83.20 | 3.60 | 0.98 | 70.75 | 3.80 | 64.22 | 2.00 | 0.27 | 7271.85 | 3.71 | 16.35 |
| Azerbaijan | 3.30 | 3.70 | 3.30 | 4.47 | 105.60 | 3.30 | 0.97 | 70.55 | 4.40 | 66.29 | 1.26 | 0.13 | 10213.21 | 13.30 | 5.92 |
| Bahrain | 5.80 | 4.00 | 5.00 | 4.30 | 86.80 | 4.50 | 0.99 | 76.40 | 5.60 | 64.22 | 2.93 | 0.61 | 27735.31 | 5.63 | 7.66 |
| Egypt | 4.10 | 3.10 | 3.90 | 3.58 | 79.30 | 2.70 | 0.98 | 70.68 | 4.30 | 69.23 | 2.62 | 0.12 | 6454.82 | 4.65 | 10.05 |
| Iran | 4.00 | 2.90 | 3.80 | 3.77 | 79.70 | 4.60 | 0.98 | 73.45 | 4.00 | 71.72 | 2.28 | 0.07 | 13311.98 | 5.15 | 11.92 |
| Israel | 6.00 | 3.10 | 6.20 | 4.83 | 90.00 | 3.50 | 1.00 | 81.70 | 4.90 | 64.57 | 1.39 | 0.44 | 31466.29 | 3.34 | 8.29 |
| Jordan | 4.80 | 3.50 | 4.60 | 5.08 | 88.10 | 4.40 | 0.98 | 73.59 | 5.20 | 64.57 | 2.65 | 0.24 | 5907.01 | 5.98 | 13.89 |
| Kuwait | 4.50 | 2.70 | 4.90 | 5.06 | 89.80 | 3.50 | 0.99 | 74.26 | 4.90 | 64.22 | 0.73 | 0.29 | 38332.08 | 4.93 | 1.50 |
| Lebanon | 3.00 | 3.10 | 2.70 | 3.82 | 81.60 | 5.60 | 0.99 | 48.22 | 2.50 | 64.22 | 1.46 | 0.32 | 15449.48 | 4.83 | 30.89 |
| Morocco | 3.80 | 3.40 | 3.50 | 3.76 | 55.80 | 4.00 | 0.97 | 70.41 | 4.10 | 59.12 | 2.84 | 0.58 | 5074.65 | 4.95 | 10.35 |
| Oman | 5.90 | 4.30 | 5.10 | 4.30 | 88.10 | 4.20 | 0.99 | 76.32 | 5.80 | 64.22 | 1.50 | 0.32 | 28148.41 | 4.92 | 8.50 |
| Qatar | 6.00 | 4.50 | 6.30 | 4.30 | 93.20 | 5.90 | 0.99 | 78.30 | 5.10 | 58.90 | 1.91 | 0.20 | 97987.01 | 13.14 | 0.74 |
| Syria | 3.00 | 2.30 | 2.90 | 4.30 | 74.00 | 3.90 | 0.99 | 74.77 | 3.60 | 64.22 | 1.61 | 0.17 | 5040.58 | 4.11 | 9.55 |
| Tunisia | 5.40 | 4.20 | 4.80 | 3.95 | 91.80 | 5.60 | 0.99 | 74.85 | 5.50 | 63.94 | 1.63 | 0.30 | 9359.29 | 3.88 | 13.47 |
| Turkey | 3.90 | 3.10 | 3.40 | 4.19 | 82.00 | 3.40 | 0.99 | 74.54 | 5.10 | 59.97 | 0.82 | 0.06 | 14543.16 | 4.41 | 10.72 |
| UAE | 5.90 | 4.30 | 4.90 | 5.91 | 93.80 | 4.90 | 0.99 | 76.78 | 6.20 | 64.22 | 0.92 | 0.20 | 47728.78 | 5.33 | 3.30 |
| Min | 3.00 | 2.30 | 2.70 | 3.24 | 55.80 | 2.70 | 0.97 | 48.22 | 2.50 | 58.90 | 0.73 | 0.06 | 5040.58 | 3.34 | 0.74 |
| Max | 6.00 | 4.50 | 6.30 | 5.91 | 105.60 | 5.90 | 1.00 | 81.70 | 6.20 | 71.72 | 2.93 | 0.61 | 97987.01 | 13.30 | 30.89 |
| average | 4.55 | 3.41 | 4.26 | 4.30 | 85.18 | 4.23 | 0.99 | 72.85 | 4.69 | 64.24 | 1.78 | 0.27 | 22751.49 | 5.77 | 10.19 |

**Corruption:** consists on the irregular payments and bribes (1 very common, 7 never occurs) source GCR 2010-2011
**Red Tape**: measured as the burden of government regulation (1 extremely burdensome, 7 not burdensome at all) source GCR (2010-2011)
**Quality of judiciary:** measured by the judicial independence (1, heavily influenced by government, 7 entirely independent) source GCR (2010-2011)
**Shadow economy:** measured as the extent of undeclared or unregistered economic activity (1 most are undeclared and unregistered, 7 most are declared or registered) GCR (2013-2014)
**Secondary school enrolment:** source GCR 2010-2011
**Education achievement:** the quality of math and science education index: source GCR 2010-2011
**Infant survival at birth:** calculated as (1000-IMR)/1000 (IMR infant mortality at Birth) source of IMR- WBG
**Life expectancy at birth:** year 2011: Life expectancy at birth indicates the average number of years a newborn infant would live. Source WBG
**Quality of infrastructure:** world competitiveness forum: 1 extremely undeveloped 7 extremely developed
**Income share of 40 % of poorest households:** 100- gini coefficient the value 64.21 is the average of the entire sample used to complete the missed data.
**Inverse of Stability of GDP growth:** the inverse of the GDP coefficient of variation the GDP consists on the annual percentages of constant price GDP are year-on-year changes.
**Inverse of Inflation:** the average of inflation from 2001 to 2011 expressed as inverse (1/x)
**GDP Per capita:** Data are derived by dividing GDP in PPP dollars by total population. These data form the basis for the country weights used to generate the World Economic Outlook.
**GDP Growth:** Annual percentages of constant price GDP are year-on-year changes (2001-2011)
**Unemployment:** Unemployment, total (% of total labour force) (modelled ILO estimate) source WBG