Measuring human development in MENA region

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Abstract

The paper aims to assess welfare improvements in the Middle East and North Africa (MENA) region using the Human Development Index (HDI). Following Pinar et al (2013) we obtain weighting schemes that yield the best- and worst-case scenarios for measured human development relying on consistent tests for stochastic dominance efficiency (SDE) when the official equally-weighted HDI is taken as benchmark. We compare the official equally-weighted HDI to all possible indices constructed from a set of individual components to obtain the most optimistic and pessimistic scenario indices for the measured human development of the MENA region. In the best-case scenario index life expectancy and GDP indices receive the highest weights for the 1975-2005 period, while the education index is the main contributor to the worst-case scenario in the same period. Furthermore, we observe a relative change in the best- and worst-case scenarios between two 15-year periods. The GDP index is the main contributor to the best-case scenario between 1975 and 1990, whereas the education index is the main contributor to the worst-case. Life expectancy contributes the most to the best-case scenario in the 1990-2005 period, while the GDP and education indices are the worst-case scenario contributors in the same period.

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Key Words: Human Development Index; MENA region; Regional Development; Mixed Integer Programming; Nonparametric Stochastic Dominance

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1 Introduction

Over the last decades, the Middle East and North Africa (MENA) region has been the least growing region, with the exception of Sub-Saharan Africa, when compared with other regions in the world (Nabli and Véganzonès-Varoudakis 2007; Bhattacharya and Wolde 2012). Moreover, the MENA region is found to display higher volatility in its performance (Makdisi et al. 2006), mainly due to the majority of its member countries' dependence on oil (Bhattacharyya and Blake 2010; Bhattacharya and Wolde 2012 among many others) and the relative weakness of its governance quality compared with other regions of the world (Guetat 2006). However, most of the studies for the MENA region have considered per capita income levels and growth only, yet it has been suggested that GDP per capita alone is not a satisfactory indicator for measuring social welfare in a country or region (see, e.g., Becker et al. 2005).

Over time composite indices and multivariate welfare analysis have become more popular (see, e.g., Fleurbaey (2009) for an overview). The most popular of the multivariate development indices is the United Nations Development Program's Human Development Index (HDI) which measures the achievements in three classical dimensions of welfare, health, education and standard of living. Therefore, in order to analyze the social welfare across the MENA region, we will consider the official HDI for our analysis in order to complement the previous studies which have mainly concentrated on income per capita levels. Until recently, HDI has been calculated as a country's average achievements in three basic aspects of human development: longevity, knowledge and a decent standard of living *using fixed equal weights*.

Even though HDI captures multidimensional welfare within and across countries, there have been major criticisms to the HDI since its first release in 1990. Firstly, the main criticism to the HDI has been the use of equal weights for each dimension. Each sub-component index, i.e. education, life expectancy and GDP, is transformed from raw components in different ways and as such it assumes a different implicit weight than the other components (see, e.g., Ravallion 1997; Noorbakhsh 1998; Ravallion 2012). Moreover, it is suggested that the official HDI is highly correlated with each sub-index and therefore different weights assigned to each sub-index would represent statistically similar indices to the original one (Cahill 2005). Therefore, even though each sub-index is weighted equally after converting the raw components into an index, each index has different implicit weights for different dimensions of human development. In this paper, rather than relying on the official HDI levels of MENA countries, we will adopt a data driven alternative weighting scheme to arrive at a composite index that will shed a different light on this issue. Moreover, HDI is constructed from data which may suffer from serious measurement errors due to lack of census data, incomplete coverage, estimated data

sets (see Ogwang 1994; Srinivasan 1994; Chamie 1994 for detailed discussions of measurement errors in the HDI). These measurement errors may lead to excessive variability in each sub-index, an issue that we will confront in this paper. We derive two extreme cases of measured human development levels for the MENA region, where these two indices not only will provide the maximum (minimum) measured development level for the MENA region but also the least volatile one over time.

Given the caveats of the official equally-weighted HDI, we will adopt stochastic dominance efficiency (SDE hereafter) methodology to derive weights that will maximize (minimize) the measured human development levels for the MENA region which are the least volatile over time. Until recently, stochastic dominance (SD) methodologies have been applied in a pair-wise manner which would have only allowed over time comparisons for a given set of countries (see, e.g., Barrett and Donald 2003; Linton et al. 2005). However, Scaillet and Topaloglou (2010), ST hereafter, extended the pair-wise comparison to a full diversification of weights to compare a given portfolio with an optimal diversified portfolio constructed from a set of assets. This methodology has been recently employed by Pinar, Stengos, and Topaloglou (2013), PST hereafter, to derive the best-case scenario for the HDI. In their application for the whole set of world countries, they find that education has been the main driver of measured development levels over time and if one were to weigh education more, that would have resulted in the most optimistic view of human development. In this paper, we will adopt the same methodology to obtain weights for each sub-index of the HDI which will offer the most optimistic (and pessimistic) measured development levels for the MENA region. Therefore, we will obtain two extreme cases of measured human development levels for the MENA region which would highlight the weakest (strongest) dimension when the whole region is considered. We first analyze the 1975-2005 period to obtain an insight about the MENA region development over the whole period. Then, we will obtain the best- and worst-case scenario weighting schemes for the two 15-year periods to shed light on the dimensions that have been moving fast (i.e., improving the development levels within the region) and dimensions which have been moving relatively slowly (i.e., holding back the development levels).

As pointed out by PST, the official HDI using an equal weight for each sub-index, ascribes a given level of development levels to each country and any other valid choice of weights may increase (decrease) the measured development levels for some of them. However, applying the SDE methodology, we will derive weights assigned to each sub-index that result in the highest and lowest possible measured level of development for the MENA region among all possible alternative weighting schemes when compared to the equally-weighted one. In other words, the SDE approach will highlight the indicators for the MENA region which are driving (holding

back) the overall improvement in measured welfare. Therefore, these two extreme indices will give the dimensions which require relatively more (less) attention by the region to improve human development levels in order to catch up with other regions of the world.

Our over time analysis suggests that GDP shifted from being in the most optimistic (i.e., best-case) scenario to the most pessimistic one. If one were to weight the GDP component higher in the earlier periods, that would have resulted in an optimistic view of development, however, the reverse is true for the later periods. The recent literature supports this findings as Nabli and Véganzonès-Varoudakis (2007) suggest that the MENA region experienced lower economic growth between 1970 and 1999 when compared with other regions in the world. Makdisi et al. (2006) also analyze the growth performance in the MENA region between 1960 and 2000, and suggest that the region experienced a higher volatility in its performance as capital has been a less efficient factor in the region compared with other regions in the world. Most importantly, many economies in the MENA region depend on oil the price of which is very volatile (Bhattacharyya and Blake 2010; Bhattacharya and Wolde 2012 among many others). Other potential factors for the relative weakness of GDP in the later periods in the MENA region are found to be corruption and bureaucratic quality (Guetat 2006).

When we consider the other components of the HDI, we find that educational attainment was the least achieved dimension for the majority of the countries in the initial period (i.e., between 1975 and 1990). Even though, there have been improvements in the education index in the region over time it is still one of the major contributor to the worst-case scenario in the later periods. Moreover, we have seen a major improvement in life expectancy levels in the region and as a result the life expectancy index gradually has been getting more weight over time. We find that life expectancy has been the fast-moving component among all indicators for the MENA region and it has become the major contributor to the best-case scenario for the period 1990-2005. On the other hand, GDP has been the slow-responding component over time and it has turned from being the major contributor to the best-case scenario between 1975 and 1990 to being the major contributor to the worst-case scenario between 1990 and 2005.

We also compare the official HDI rankings of the MENA region with the rankings of the best- and worst-case scenario of the HDI. At the initial periods, countries attained unbalanced achievements in different dimensions and as such they experienced major rank reversals between the best- and worst-case scenarios. However, between 1990 and 2005, countries which ranked in highest and lowest positions with the official HDI also experienced highest and lowest positions in the best- and worst-case scenario respectively. In other words, the countries which were ranked in the highest and lowest positions with the official HDI between 1990 and 2005 have experienced a balanced improvement in all dimensions compared with the other countries in

the MENA region. Finally, it is worth noting that no matter how development is measured, Israel has always been the most developed country within the region and stayed in the highest ranking in almost in all best-, worst- and official cases of the HDI.

The remainder of the paper is as follows. In section 2, following PST we present the main framework of analysis. We present the stochastic dominance efficiency test of the ST methodology and its mathematical formulations. In section 3, we present the formulation of HDI and its descriptive statistics. In section 4, we present the most optimistic and pessimistic weights for the different constituent components for the MENA region for different periods in order to examine the welfare improvements in the separate components and in the official HDI over time. Finally, we conclude in section 5.

2 SD Efficiency Testing

In this section, we offer the stochastic dominance efficiency methodology which gives the most optimistic and pessimistic measurement of human development levels for MENA region for different sub-periods. Let us consider a strictly stationary process $\{\boldsymbol{Y}_t; t \in Z\}$ taking values in $\mathbb{R}^3$. The observations consist of a realization of $\{\boldsymbol{Y}_t;\ t = 1, ..., T\}$. These data correspond to observed values of the three different components of the HDI (i.e., education, life expectancy and GDP indices). We denote by $F(\boldsymbol{y})$, the continuous cdf of $\boldsymbol{Y} = (Y_1, ..., Y_3)'$ at point $\boldsymbol{y} = (y_1, ..., y_3)'$. In this case, we consider a hybrid composite index with a weighting vector $\boldsymbol{\lambda} \in \mathbb{L}$ where $\mathbb{L} := \{\boldsymbol{\lambda} \in \mathbb{R}^3_+ : \boldsymbol{e}'\boldsymbol{\lambda} = 1\}$ with $\boldsymbol{e}$ being a vector of ones. This means that all the different components have positive weights and that these weights sum up to one. Let us denote by $G(z, \boldsymbol{\lambda}; F)$ the cdf of the hybrid index value $\boldsymbol{\lambda}'\boldsymbol{Y}$ at point z given by $G(z, \boldsymbol{\lambda}; F) := \int_{\mathbb{R}^3} \mathbb{I}\{\boldsymbol{\lambda}'\boldsymbol{u} \leq z\} dF(\boldsymbol{u})$.

2.1 Tests for SD efficiency of different indices

In this section, we derive statistics to test for SD efficiency of the equally-weighted official HDI for the MENA region, index with equal weight vector $\boldsymbol{\tau}$, when compared with all possible combinations of weighting schemes ($\boldsymbol{\lambda}$) constructed from the set of components. Even though $\boldsymbol{\lambda}$ and $\boldsymbol{\tau}$ represent weighting vectors, we use them interchangeably with the index that they represent for simplicity. In this paper we test whether the official HDI, $\boldsymbol{\tau}$, i.e., equal weights given to each sub-index, is the best-case (worst-case) scenario, in the sense that it gives the maximum (minimum) value and lower variability of measured human development levels across countries and over time or whether we can construct another composite index $\boldsymbol{\lambda}$ (alternative

weighting scheme) from the set of components that dominates (or is dominated by) it.

If the cumulative distribution function with index $\boldsymbol{\lambda}$ dominates the cumulative distribution function of the index $\boldsymbol{\tau}$ stochastically at first-order (SD1), then $G(z, \boldsymbol{\tau}; F) \geq G(z, \boldsymbol{\lambda}; F)$ holds for any argument z. In this case, z represents a development level, then the inequality in the definition means that the proportion of countries in distribution $\boldsymbol{\lambda}$ with value of development smaller than z is not larger than the proportion of such countries in $\boldsymbol{\tau}$. Therefore, there is always higher human development level in the index with $\boldsymbol{\lambda}$ than in $\boldsymbol{\tau}$. On the other hand, if the cumulative distribution function of the index $\boldsymbol{\tau}$ dominates the distribution with index $\boldsymbol{\lambda}$, i.e., $G(z, \boldsymbol{\lambda}; F) \geq G(z, \boldsymbol{\tau}; F)$, the index $\boldsymbol{\lambda}$ offers the lowest possible development level when compared with index $\boldsymbol{\tau}$. Therefore, we will perform two complementary tests. We will test whether the equally-weighted HDI is the best- (or the worst)-case scenario against all possible alternative combinations and whether there will exist alternative weighting schemes which are different than the equally-weighted index which offer the best- and worst-case measured human development level.

The objective function for the best-case scenario is the following:

$$\underset{z,\boldsymbol{\lambda}}{Max}[G(z, \boldsymbol{\tau}; F) - G(z, \boldsymbol{\lambda}; F)]$$

The above maximization results in the best-case scenario (most optimistic) hybrid index λ constructed from the set of components in the sense that it reaches the highest level of measured human development for a given probability. Whereas, the following objective function is for the worst-case scenario:

$$\underset{z,\boldsymbol{\lambda}}{Max}[G(z, \boldsymbol{\lambda}; F) - G(z, \boldsymbol{\tau}; F)]$$

In this case, the maximization problem above offers the worst-case scenario (the most pessimistic) index $\boldsymbol{\lambda}$ constructed from the set of components.

Similarly, if the first-order dominance does not hold, we move to the second order dominance. In this case, the underlying area below the integral of two distributions are compared rather than the point-wise comparisons (see PST for the details on the second order stochastic dominance efficiency).

We can further define for $z \in \mathbb{R}$:

$$\begin{aligned}
\mathcal{J}_1(z, \boldsymbol{\lambda}; F) &:= G(z, \boldsymbol{\lambda}; F), \\
\mathcal{J}_2(z, \boldsymbol{\lambda}; F) &:= \int_{-\infty}^{z} G(u, \boldsymbol{\lambda}; F) du = \int_{-\infty}^{z} \mathcal{J}_1(u, \boldsymbol{\lambda}; F) du, \\
\mathcal{J}_3(z, \boldsymbol{\lambda}; F) &:= \int_{-\infty}^{z} \int_{-\infty}^{u} G(v, \boldsymbol{\lambda}; F) dv du = \int_{-\infty}^{z} \mathcal{J}_2(u, \boldsymbol{\lambda}; F) du,
\end{aligned}$$

and so on.

From Davidson and Duclos (2000) Equation (2), we know that

$$\mathcal{J}_j(z, \boldsymbol{\lambda}; F) = \int_{-\infty}^{z} \frac{1}{(j-1)!} (z-u)^{j-1} dG(u, \boldsymbol{\lambda}, F),$$

which can be rewritten as

$$\mathcal{J}_j(z, \boldsymbol{\lambda}; F) = \int_{\mathbb{R}^n} \frac{1}{(j-1)!} (z - \boldsymbol{\lambda}'\boldsymbol{u})^{j-1} \mathbb{I}\{\boldsymbol{\lambda}'\boldsymbol{u} \leq z\} dF(\boldsymbol{u}).$$

The general hypotheses for testing SD efficiency of order j of τ, hereafter SDJ, can be written compactly as:

$$\begin{aligned}
H_0^j &: \mathcal{J}_j(z, \boldsymbol{\tau}; F) \leq \mathcal{J}_j(z, \boldsymbol{\lambda}; F) && \text{for all } z \in \mathbb{R} \text{ and for all } \boldsymbol{\lambda} \in \mathbb{L}, \\
H_1^j &: \mathcal{J}_j(z, \boldsymbol{\tau}; F) > \mathcal{J}_j(z, \boldsymbol{\lambda}; F) && \text{for some } z \in \mathbb{R} \text{ or for some } \boldsymbol{\lambda} \in \mathbb{L}.
\end{aligned}$$

Under the null Hypothesis H_0^j there is no hybrid index $\boldsymbol{\lambda}$ constructed from the set of components that dominates the index $\boldsymbol{\tau}$ at order j. On the other hand, under the alternative hypothesis H_1^j, there exist an alternative index $\boldsymbol{\lambda}$ for some arguments z, where the function $\mathcal{J}_j(z, \boldsymbol{\tau}; F)$ is greater than the function $\mathcal{J}_j(z, \boldsymbol{\lambda}; F)$. In this case, index with $\boldsymbol{\lambda}$ dominates the index with $\boldsymbol{\tau}$ at first order sense and therefore there is an alternative weighting for the best-case scenario. For the worst-case scenario, one can reverse the inequality signs in the null and alternative hypothesis. In this case, the null hypothesis suggest that the given index, $\boldsymbol{\tau}$, is the worst-case scenario, whereas, the alternative hypothesis suggests that there exists alternative weighting for some development level z that offers the worst-case scenario.

We provide the empirical counterpart of distributions for the tests by changing F with its empirical counterpart $\hat{F}$ as:

$$\mathcal{J}_j(z, \boldsymbol{\lambda}; \hat{F}) = \frac{1}{T} \sum_{t=1}^{T} \frac{1}{(j-1)!} (z - \boldsymbol{\lambda}' \boldsymbol{Y}_t)^{j-1} \mathbb{I}\{\boldsymbol{\lambda}' \boldsymbol{Y}_t \leq z\},$$

This can be rewritten more compactly for $j \geq 2$ as:

$$\mathcal{J}_j(z, \boldsymbol{\lambda}; \hat{F}) = \frac{1}{T} \sum_{t=1}^{T} \frac{1}{(j-1)!} (z - \boldsymbol{\lambda}' \boldsymbol{Y}_t)_+^{j-1}.$$

We consider the weighted Kolmogorov-Smirnov type test statistic for the best-case scenario

$$\hat{S} := \sqrt{T} \frac{1}{T} \sup_{z, \boldsymbol{\lambda}} \left[G(z, \boldsymbol{\tau}; \hat{F}) - G(z, \boldsymbol{\lambda}; \hat{F}) \right],$$

and similarly the weighted Kolmogorov-Smirnov type test statistic for the worst-case scenario can be obtained by changing the order of the cumulative distribution functions with τ and λ

$$\hat{S} := \sqrt{T} \frac{1}{T} \sup_{z, \boldsymbol{\lambda}} \left[G(z, \boldsymbol{\lambda}; \hat{F}) - G(z, \boldsymbol{\tau}; \hat{F}) \right],$$

and a test based on the decision rule:

$$\text{reject} \quad H_0^j \quad \text{if} \quad \hat{S}_j > c_j \,,$$

where c_j is some critical value (see ST, section 2 for the derivation of the test and see Appendix B of the PST for the asymptotic properties of the test statistic). To make the result operational, we need to find an appropriate critical value c_j. Since the distribution of the test statistic depends on the underlying distribution, we rely on a block bootstrap method to simulate p-values (see Appendix D2 of the PST for the simulation p-values for dependent data using block bootstrapping methods).

3 Mathematical formulation of the test statistics

Testing for the first-order of SD efficiency is based on the following test statistic $\hat{S}_1$, derived using mixed integer programming formulations. The full formulation of the testing problem for

the best-case scenario is given below:

$$\max_{\mathbf{z},\boldsymbol{\lambda}} \hat{S}_1 = \sqrt{T}\frac{1}{T}\sum_{t=1}^{T}(L_t - W_t) \tag{3.1a}$$

$$\text{s.t.} M(L_t - 1) \leq z - \boldsymbol{\tau}'\boldsymbol{Y}_t \leq ML_t, \qquad \forall t \tag{3.1b}$$

$$M(W_t - 1) \leq z - \boldsymbol{\lambda}'\boldsymbol{Y}_t \leq MW_t, \qquad \forall t \tag{3.1c}$$

$$\boldsymbol{e}'\boldsymbol{\lambda} = 1, \tag{3.1d}$$

$$\boldsymbol{\lambda} \geq 0, \tag{3.1e}$$

$$W_t \in \{0,1\},\ L_t \in \{0,1\}, \qquad \forall t \tag{3.1f}$$

with M being a large constant.

The model is a mixed integer program maximizing the distance between the sum over all scenarios of two binary variables, $\frac{1}{T}\sum_{t=1}^{T} L_t$ and $\frac{1}{T}\sum_{t=1}^{T} W_t$ which represent $G(z, \boldsymbol{\tau}; \hat{F})$ and $G(z, \boldsymbol{\lambda}; \hat{F})$, respectively (the empirical cdf of $\boldsymbol{\tau}$ and $\boldsymbol{\lambda}$ at point z). According to inequalities (3.1b), L_t equals 1 for each scenario $t \in T$ for which $z \geq \boldsymbol{\tau}'\boldsymbol{Y}_t$, and 0 otherwise. Analogously, inequalities (3.1c) ensure that W_t equals 1 for each scenario for which $z \geq \boldsymbol{\lambda}'\boldsymbol{Y}_t$. Equation (3.1d) defines the sum of all index weights to be unity, while inequality (3.1e) disallows negative weights. The above maximization problem tests whether the equally-weighted HDI, $\boldsymbol{\tau}$, is the best-case scenario or one can obtain the best-case scenario with alternative weighting scheme of the components, $\boldsymbol{\lambda}$. Whereas, for the worst-case scenario mathematical formulation, one can change the ordering of the binary variables, L_t and W_t in the maximization problem to obtain the worst-case scenario weighting scheme. For both cases, one can further reduce the maximization problem by solving the smaller problem since the optimal values of the L_t variables are known in the problem (see Appendix E1 of the PST for the derivation of this formulation and details on its practical implementation)[1].

In this section, we offered the test statistics for the SD efficiency of the official HDI (i.e., each sub-index being equally-weighted) with respect to all possible combinations of weighting schemes constructed from the set of components. In the next section, we offer the descriptive statistics of the HDI and its components for the MENA region and we derive the best-case (most optimistic) and the worst-case (most pessimistic) scenarios for the MENA region for the period of 1975-2005. Findings of the 1975-2005 period is complemented with the best- and worst-case scenario weighting schemes for different sub-periods to highlight the dynamic progress of the

[1]Similarly, a maximization problem is used for the second-order stochastic dominance efficiency, see Appendix E2 of the PST for the formulation for testing for second-order dominance efficiency.

development levels in the MENA region.

4 Empirical Analysis of SD efficiency of HDI

4.1 Data and Descriptive Statistics

We use the United Nations Development Program's HDI and its components - life expectancy, education and GDP indices for the period 1975 to 2005 in 5-year increments for analyzing the progress in the human development levels of the MENA region. Each index takes values between 0 and 1 (from lowest to highest well being). The HDI represents the simple arithmetic average of the three individual indices.

The definition of the life expectancy index (LE) is given by $LE = \frac{LE-25}{85-25}$. The life expectancy raw data series has an upper bound of 85 and a lower bound of 25 years. The value of a country's life expectancy index is obtained by the country's life expectancy in years minus 25 divided by 60, for a number that would lie between 0 and 1. The education index (E) is defined as $E=$ $\frac{2}{3}$(adult literacy index) + $\frac{1}{3}$(gross enrollment index). This index is constructed so that a 2/3 weight is given to literacy (percentage of the population that is considered literate) and a 1/3 weight is given to gross school enrollment as a percentage of the eligible school age population and it is bounded between 0 and 1. Finally, the GDP per capita index is defined as, $GDP\ Index=\frac{\log\text{ (GDP per capita) - }\log\text{ (100)}}{\log\text{ (40000)-}\log\text{ (100)}}$. It is created in a similar manner as LE, where the upper bound for the raw GDP per capita series is 40000 and the lower bound is 100 US dollars per capita. The values taken by the index lie in the (0,1) range. Each separate index is then equally weighted to create the HDI.[2]

Table 1

Table 1 presents the descriptive statistics for the HDI and the individual component indices over time for the MENA region. One can see that there has been a constant increase in the LE, E and HDI, on average, between 1975 and 2005 whereas, the GDP index, on average, increased between 1975 and 1980, decreased between 1980 and 1990, and finally, increased again between 1995 and 2005. The GDP index has the largest mean between 1975 and 1985, whereas the LE index has the largest mean between 1990-2005. Finally, the E index has been increasing over the whole period and attained the second largest mean after 2000. Given the variation

[2]Starting from 2010 and being updated in 2011, the UNDP made adjustments to how the HDI is constructed. See 2011 Human Development Report technical report for the details. http://hdr.undp.org/en/media/HDR_2011_EN_TechNotes.pdf

among the components of the HDI, we not only consider the best- and worst-case scenario for the whole period but also we provide the best- and worst-case scenario for two sub-periods of 15 years in order to capture the dynamic progress of human development in the MENA region. In the next section we will examine the SD dominance results for these indices separately to obtain the most optimistic and pessimistic development levels in the MENA region over the 30 year period.

4.2 SDE Results for HDI of the MENA region

In this section, we first test for SD efficiency of the official HDI of the MENA region between 1975 and 2005. Secondly, we test for different sub-periods to analyze the evolution of the best- and worst-case scenario over the whole period to shed light on the improvements and/or deteriorations of the components of HDI. In other words, the sub-period analysis will reveal information about the fast- and slow-responding components of HDI over time for the MENA region.

We first test whether the equally-weighted HDI offers the best- or worst-case scenario for the 1975-2005 period. We find that the equally-weighted HDI is not best-case scenario, since we can construct many other composite indices, $\boldsymbol{\lambda}$, consisting of the three components of the HDI (life expectancy, education, and GDP indices) that stochastically dominate the equally-weighted HDI, $\boldsymbol{\tau}$, in the first-order sense. Table 2 summarizes the results. As it is indicated in the first line of the table we find that there are 112 different composite indices that dominate the equally-weighted index and we present their average weights for each component. We find that the GDP and the life expectancy indices have the greatest weights for the best-case scenario with weights of 54.63% and 41.59% respectively. On the other hand, the education index takes weight of 3.78% for the best-case scenario. Since the equally-weighted index does not correspond to the best-case scenario, we now test it whether it corresponds to the worst-case scenario. The second line of Table 2 presents the results for the worst-case scenario for the period of 1975-2005. We find that there are 111 composite indices which were dominated by the official HDI, therefore providing worse measured development levels for the MENA region. We find that the education index is the major contributor to the worst-case scenario with a weight of 84.34%. On the other hand, the GDP and life expectancy indices contribute with weights of 8.69% and 6.97% respectively.

Table 2

The SD inefficiency of the official HDI indicates that the equal weighting scheme is neither the best- nor the worst-case scenario but countries achieve moderate levels of measured devel-

opment as there are alternative weighting schemes that assign a higher and lower measured development level for the MENA region. The findings for the MENA region differ from the PST findings, where the most optimistic weighting scheme considered for all countries in the world has the education index as the major contributor to the best-case scenario. However, PST also pointed out that even though most countries achieve higher levels of measured development when education gets more weight, there are countries which have not done well in that dimension, with the majority of them being part of the MENA region. For the MENA region, over the last 30 years, the best-case scenario is achieved mainly by the attainments of most of these countries in the GDP and life expectancy dimensions. Hence, weighting these dimensions more heavily would suggest higher measured development levels for the majority of the countries in the MENA region. On the other hand, the least attained dimension by most of the MENA countries over the last 30 years has been education and therefore if one were to weight education dimension more, the measured development levels in the MENA region would have resulted in the worst-case scenario.

We also carried our some additional analysis for different sub-periods in order to examine the dynamic evolution of the best- and worst-case scenario over time. We tested the SD efficiency of the official HDI for the 1975-1990, 1980-1995, 1985-2000, and 1990-2005 periods. These results are also included in Table 2 above. This analysis will not only shed light on how the best- and worst-case scenarios have been changing over time, but it will also reveal the dimensions which have been improving and/or deteriorating over time.

We first test whether the equally-weighted HDI is the best- or the worst-case scenario for the 1975-1990 period. We find that the official HDI is neither the best- nor the worst-case scenario over the 1975-1990 period. As can be followed from Table 2, for this period we find 56 and 59 composite indices which dominate and are dominated by the equally-weighted HDI respectively for the best-case and worst-case scenarios. For the first 15-year period, the GDPhas been the major contributor with a weight of 84.39% to the best-case scenario, whereas, the education index contributes the most to the worst-case scenario with a weight of 89.50%. Therefore, for the first 15-year period for the MENA region, the GDP and education indices have been the highest and lowest achieving dimensions respectively.

When we move to the 1980-1995 period, we find that the GDP and life expectancy indices have been the main contributors to the best-case scenario with weights of 54.76% and 40.73% respectively. Compared with the best-case scenario in the period of 1975-1990, life expectancy gets more weight and GDP index gets less weight in the best-case scenario since there have been major improvements in life expectancy and slight deterioration in GDP between 1975 and 1995. Therefore, life expectancy has been the fast-responding dimension for the MENA

region over 20 years and GDP almost stayed steady over the 20 years (i.e., slow responding dimension). In the worst-case scenario for the 1980-1995 period the education index is the major contributor with a weight of 90.28%. Even though there has been an improvement in the education index between 1975 and 1995, the other dimensions have been offering better levels of measured development.

For the 1985-2000 period we find that life expectancy is clearly the main contributor to the best-case scenario with a weight of 65.90%, whereas GDP contributes with a weight of 29.78%. In the worst-case scenario case, however, education becomes the main contributor with a weight of 74.63%, while GDP gets a weight of 18.80%.

Finally, the best- and worst-case scenario weighting schemes for the 1990-2005 period is presented. For this last 15-year period, life expectancy clearly contributes the most to the best-case scenario with a weight of 89.4% and GDP is the least contributor with a weight of 0.64%. For the worst-case scenario, the GDP and education indices are the major contributors with weights of 54.05% and 41.45% respectively.

Overall, best- and worst-case scenarios for the MENA region have been gradually changing over a period of 30 years. MENA countries have experienced major improvements in life expectancy which as a result has become the major contributor to the best-case scenario. GDP was the major contributor in the first 15-year period to the best-case scenario, however, it has become the main contributor to the worst-case scenario in the last 15-year period. Countries in the MENA region have been experiencing major improvements in life expectancy and education over time, but GDP has remained relatively stagnant (slow-responding) over time. Furthermore, even though education has been the main contributor to the worst-case scenario in the earlier periods, most MENA countries have gradually been seeing their educational achievements improve lately. As such education has gradually started to contribute less to the most pessimistic scenario.

Next, we will proceed to present country rankings for the MENA region between 1975 and 2005 using the most optimistic and pessimistic scenarios as well as the equally-weighted official HDI. For the most optimistic and pessimistic cases, we use the weighting schemes derived in Table 2. Table 3 illustrates the rankings of countries using the best-case and worst case scenarios of the HDI for the 1975 to 1990 period with the weights of first two rows (representing the period of 1975-2005)of Table 2 respectively. Similarly, Table 4 reports the best- and worst-case scenario rankings for the 1990 to 2005 period using the weighting schemes from the last two rows (representing the period of 1990-2005)of Table 2 respectively.

Table 3 and 4

For example for 1975, Israel ranked first in the official HDI, but ranked fourth in the best-case scenario and first in the worst-case scenario. Malta, Turkey, Syria, Tunisia and Egypt were the countries which moved to a lower ranking in the best-case scenario, but except Tunisia, they experienced a higher ranking in the worst-case scenario when compared with their respective ranking with the official HDI. On the other hand, United Arab Emirates, Saudi Arabia, Algeria, and Oman experienced a better ranking in the best-case scenario but moved to a lower ranking in the worst-case scenario. These countries experienced a better GDP per capita but were the worse group in the worst-case scenario of development, mainly in their educational levels. A similar pattern is experienced for these countries over the period between 1975 and 1990.

In Table 4, we report the rankings of the best- and worst-case scenarios for the period between 1990 and 2005. Between 1975 and 1990, improvements in different dimensions of the HDI have been experienced by many countries in the MENA region and therefore the best-case and worst-case scenarios have now changed. In this period, countries which ranked in higher positions with the official HDI also experienced higher rankings in the best- and worst-case scenario, something that suggests that countries in the higher rankings experienced a balanced improvement in all dimensions compared with the rest of the MENA countries. Therefore, no matter which weighting scheme is used these countries have remained in the higher rankings. For example, Israel always ranked in the first position among the countries in the MENA region with the official, best-case and worst-case scenario HDI. Similarly, Malta, Bahrain, United Arab Emirates, and Kuwait ranked second to fifth position with the official, best- and worst-case scenario HDI. The same is true for countries ranked in the lower positions. Egypt, Morocco, Djibouti and Yemen ranked between 15th to 18th position with minor changes among them in the best- and worst-case scenario suggesting that these countries were experiencing lower achievements in both cases.

Table 5 and 6

To make the ranking differences between the best- and worst-case scenario of the HDI more obvious, we present the rank differences between the best- and worst-case scenario for a given year in Table 5 and 6. Both tables report the difference between a ranking of country in the worst-case and best-case scenario. A positive difference suggests that a given country ranks better in the best-case scenario, whereas, a negative difference suggests that a given country ranks higher in the worst-case scenario. Both panels shed light on whether the different countries in the MENA region experienced balanced improvements in all dimensions relative to other countries (i.e., stayed in their relative ranking in the best-case and worst-case scenario). Between 1975 and 1990, the countries which ranked in a higher position in the best-case when compared

with the worst-case scenario are Oman, Saudi Arabia, United Arab Emirates, Algeria with at least four position difference due to their high achievement levels in the GDP per capita and low achievement levels in the educational attainment. On the other hand, Lebanon, Syria, Jordan, Turkey and Malta experienced higher rankings in the worst-case scenario when compared with the best-case scenario due to their relatively better achievements in the education index. Finally, between 1995 and 2005, Syria and Lebanon ranked in a higher position in the best-case scenario when compared with the worst-case due to their better life expectancy levels crelative to their educational and standard of living achievements (see Table 6).

Since the last three 5-year periods have the full country coverage, we analyzed the improvements and/or deteriorations in the rankings in the official, best- and worst-case scenario HDI for the 5-year periods 1995 to 2000, and 2000 to 2005. Table 7 reports the rank changes over time in each respective index. Most countries experienced a stable relative ranking over time where the maximum rank change in each respective index is one position between 1995 and 2000, and two positions between 2000 and 2005. Between 2000 and 2005, there is a bit more volatility between the rankings when compared to the rank changes between 1995 and 2000. Among all countries, Bahrain and Lebanon moved to a lower ranking, whereas Kuwait and Turkey experienced an improvement in their ranking by two positions in the official HDI between 2000 and 2005 period. For example, Lebanon moved to a lower ranking by two position in the best-case scenario, since even though it had experienced an improvement in all dimensions, its improvement in life expectancy was relatively lower when compared with other countries. On the other hand, Kuwait experienced an improvement in its worst-case scenario and Turkey moved to a higher ranking in the best-case scenario by two positions since Kuwait had a major improvement in its education and GDP indices and Turkey experienced a sizeable improvement in its life expectancy.

Table 7

Finally, we examine the improvements in the relative levels of human development when the best- and worst-case scenario weighting schemes are used compared with the equally-weighted official HDI. Table 8 summarizes the number of countries that fall into low, medium, high and very high human development groups with the official, best- and worst-case weighting scheme of the HDI. Each group consist of countries that have HDI values less than 0.5, between 0.5 and 0.799, between 0.8 and 0.899, and above 0.9 respectively. Between 1975 and 1990, we employ the weights obtained in the for the 1975 to 1990 period with the weights of first two rows of Table 2 to have the best- and worst-case scenario distribution of countries and Table 8 reports the results. For example, in 1975, there were three countries in the low development

group with the official HDI whereas, there were one and seven countries in the same group with the best- and worst-case scenario respectively. There was only one country falling into the high development group with the official HDI, whereas in the best-case scenario there were two countries falling in that group and no countries with the worse-case scenario. Typically for the years 1980, 1985 and 1990 the official HDI offers in-between measured development levels when compared with the best- and worst-case scenarios. However, over time, there have been less evident changes across groups. For example, in 1995 and 2000, both the official and the worst-case scenario classified MENA countries into different development groups similarly. Furthermore, the only difference between the official and best-case scenario in 1995 and 2000 is that in the best-case scenario there was only one country in the low development group, whereas there were two countries in that group with the official HDI. Overall, the results suggest that the improvements in MENA countries in the earlier years have been relatively faster when compared with the later periods.

Table 8

5 Conclusion

In this paper we assess welfare improvements in the MENA region by employing the SDE approach to derive the best- and worst-case weighting schemes for the three components of the HDI. We obtain weighting schemes that resulted in the best- and worst-case scenarios for measured human development relying on consistent stochastic dominance efficiency tests when the official equally-weighted HDI is taken as benchmark. In the best-case scenario index, while the life expectancy and GDP indices receive the highest weight for the 1975-2005 period, the education index is the main contributor to the worst-case scenario in the same period. We observe a change in the best- and worst-case scenarios between 15-year periods. The GDP index is the main contributor to the best-case scenario between 1975 and 1990, whereas education index is the main contributor to the worst-case. On the other hand, life expectancy contributes the most to the best-case scenario in the 1990-2005 period and the GDP and education indices are the worst-case scenario contributors in the same period.

The results suggest that most countries have higher levels of GDP per capita in the MENA region between 1975-2000 when compared with other indicators, whereas the educational achievement was the least achieved dimension by most of these countries. However, over time, the majority of the countries in the MENA region experienced major improvements in their life expectancy levels. Life expectancy has been the fast-moving component among all indicators for

the MENA region and as such it has become the major contributor to the best-case scenario for the period 1990-2005. On the other hand, GDP has been the slow-responding component over time and from being the major contributor to the best-case scenario between 1975 and 1990, it has become the major contributor to the worst-case scenario between 1990 and 2005 as the other two components of the HDI have been improving over the period a lot faster than GDP. Finally, even though, there has been improvements in the education index over the period, it is still one of the major contributors to the worst-case scenario in the later periods.

We also compare the official HDI rankings of the MENA region with the rankings of the best- and worst-case scenario of the HDI. Between 1975 and 1990, there have been major improvements in different dimensions of the HDI, with many countries experiencing major rank reversals between the best- and worst-case scenarios. However, between 1990 and 2005, countries which ranked in highest and lowest positions with the official HDI also experienced highest and lowest positions in the best- and worst-case scenario respectively. In other words, the countries which were ranked in the highest and lowest positions with the official HDI between 1990 and 2005 have experienced a balanced improvement in all dimensions compared with the rest of the MENA region countries. Finally, we analyze the distribution of countries in different human development groups from 1975 to 2005.

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Tables and Figures

Table 1: Descriptive statistics

Human development index							
Year	1975	1980	1985	1990	1995	2000	2005
Sample size	13	15	15	16	18	18	18
Mean	0.594	0.641	0.677	0.681	0.705	0.731	0.763
Median	0.567	0.614	0.65	0.682	0.711	0.744	0.773
Standard deviation	0.189	0.176	0.138	0.204	0.248	0.248	0.23

Life expectancy index							
Year	1975	1980	1985	1990	1995	2000	2005
Sample size	13	15	15	16	18	18	18
Mean	0.587	0.641	0.689	0.711	0.735	0.761	0.785
Median	0.545	0.617	0.673	0.715	0.747	0.769	0.785
Standard deviation	0.146	0.124	0.097	0.114	0.198	0.196	0.182

Education index							
Year	1975	1980	1985	1990	1995	2000	2005
Sample size	13	15	15	16	18	18	18
Mean	0.483	0.554	0.616	0.648	0.677	0.72	0.769
Median	0.454	0.563	0.63	0.65	0.687	0.723	0.792
Standard deviation	0.355	0.323	0.276	0.319	0.309	0.301	0.236

GDP index							
Year	1975	1980	1985	1990	1995	2000	2005
Sample size	13	15	15	16	18	18	18
Mean	0.714	0.728	0.725	0.684	0.702	0.711	0.737
Median	0.657	0.683	0.695	0.667	0.674	0.698	0.735
Standard deviation	0.34	0.29	0.193	0.358	0.386	0.398	0.407

Table 2: Scenario weighting scheme human development index (1975-2005)

Scenario	Period	Highest distance	Number of observations	Number of indices that dominate fixed weighted HDI	Stochastic efficient weights		
					Life expectancy index	Education index	GDP Index
Best	1975-2005	0.0243	113	112	0.4159	0.0378	0.5463
Worst	1975-2005	0.0424	113	111	0.0697	0.8434	0.0869
Best	1975-1990	0.0615	59	56	0.1204	0.0357	0.8439
Worst	1975-1990	0.0711	59	59	0.0485	0.895	0.0565
Best	1980-1995	0.0317	64	62	0.4073	0.0451	0.5476
Worst	1980-1995	0.0508	64	58	0.0305	0.9028	0.0667
Best	1985-2000	0.0262	67	60	0.659	0.0432	0.2978
Worst	1985-2000	0.0711	67	60	0.0657	0.7463	0.188
Best	1990-2005	0.028	70	47	0.8942	0.0994	0.0064
Worst	1990-2005	0.0318	70	66	0.045	0.4145	0.5405

Table 3: Country rankings in MENA region in the years 1975, 1980, 1985 and 1990

Equally-weighted official HDI ranking	Country	The best (worst) case scenario ranking in 1975	Country	The best (worst) case scenario ranking in 1980	Country	The best (worst) case scenario ranking in 1985	Country	The best (worst) case scenario ranking in 1990
1	Israel	4 (1)	Israel	4 (1)	Israel	2 (1)	Israel	2 (1)
2	Kuwait	2 (3)	Kuwait	2 (3)	Malta	7 (2)	Malta	4 (2)
3	UAE	1 (5)	UAE	1 (6)	UAE	1 (6)	Bahrain	3 (3)
4	Malta	7 (2)	Malta	6 (2)	Bahrain	3 (3)	UAE	1 (5)
5	Saudi Arabia	3 (8)	Bahrain	5 (4)	Kuwait	4 (4)	Saudi Arabia	5 (10)
6	Turkey	9 (4)	Saudi Arabia	3 (10)	Saudi Arabia	5 (10)	Oman	6 (13)
7	Iran	6 (7)	Jordan	10 (5)	Jordan	10 (5)	Jordan	11 (6)
8	Syria	11 (6)	Turkey	11 (7)	Turkey	11 (7)	Turkey	7 (7)
9	Tunisia	10 (9)	Syria	13 (8)	Oman	6 (14)	Lebanon	15 (4)
10	Algeria	8 (11)	Tunisia	12 (11)	Syria	13 (8)	Tunisia	9 (11)
11	Oman	5 (13)	Iran	9 (9)	Tunisia	12 (11)	Iran	10 (9)
12	Egypt	13 (10)	Algeria	8 (12)	Iran	9 (9)	Algeria	8 (12)
13	Morocco	12 (12)	Oman	7 (14)	Algeria	8 (12)	Syria	13 (8)
14			Egypt	15 (13)	Egypt	15 (13)	Egypt	14 (14)
15			Morocco	14 (15)	Morocco	14 (15)	Morocco	12 (15)
16							Yemen	16 (16)

The ranking of countries with the best and worst case scenarios of the HDI are obtained by using the stochastic efficient weights offered in panels (a) and (b) of Table 5 respectively. Countries in the MENA region are ranked according to their official HDI. Each countrys best and worst case scenario rankings are given for the years 1975, 1980, 1985 and 1990. The best-case scenario rankings are reported on the left panel for each year and the worst-case scenario rankings of countries are reported in parentheses.

Table 4: Country rankings in MENA region in the years 1990, 1995, 2000 and 2005

Equally-weighted official HDI ranking	Country	The best (worst) case scenario ranking in 1975	Country	The best (worst) case scenario ranking in 1980	Country	The best (worst) case scenario ranking in 1985	Country	The best (worst) case scenario ranking in 1990
1	Israel	1 (1)	Israel	1 (1)	Israel	1 (1)	Israel	1 (1)
2	Malta	2 (4)	Malta	2 (2)	Malta	2 (2)	Kuwait	4 (2)
3	Bahrain	4 (2)	Bahrain	5 (3)	Bahrain	5 (3)	Malta	2 (4)
4	UAE	3 (3)	UAE	4 (4)	Kuwait	4 (4)	UAE	3 (5)
5	Saudi Arabia	10 (5)	Kuwait	3 (5)	UAE	3 (5)	Bahrain	5 (3)
6	Oman	6 (7)	Saudi Arabia	11 (6)	Oman	6 (6)	Oman	6 (7)
7	Jordan	9 (8)	Oman	6 (7)	Saudi Arabia	11 (7)	Saudi Arabia	10 (6)
8	Turkey	12 (6)	Lebanon	8 (9)	Lebanon	9 (9)	Turkey	12 (8)
9	Lebanon	5 (10)	Turkey	13 (8)	Jordan	10 (10)	Jordan	9 (11)
10	Tunisia	8 (12)	Jordan	10 (10)	Turkey	14 (8)	Lebanon	11 (9)
11	Iran	13 (9)	Tunisia	7 (12)	Tunisia	7 (11)	Tunisia	8 (12)
12	Algeria	11 (11)	Iran	14 (11)	Iran	13 (12)	Iran	14 (10)
13	Syria	7 (13)	Syria	9 (14)	Algeria	12 (13)	Algeria	13 (13)
14	Egypt	15 (14)	Algeria	12 (13)	Syria	8 (14)	Syria	7 (15)
15	Morocco	14 (15)	Egypt	16 (15)	Egypt	15 (15)	Egypt	15 (14)
16	Yemen	16 (16)	Morocco	15 (16)	Morocco	16 (16)	Morocco	16 (16)
17			Djibouti	18 (17)	Djibouti	18 (17)	Djibouti	18 (17)
18			Yemen	17 (18)	Yemen	17 (18)	Yemen	17 (18)

The ranking of countries with the best and worst case scenarios of the HDI are obtained by using the stochastic efficient weights offered in panels (a) and (b) of Table 5 respectively. Countries in the MENA region are ranked according to their official HDI. Each countrys best and worst case scenario rankings are given for the years 1975, 1980, 1985 and 1990. The best-case scenario rankings are reported on the left panel for each year and the worst-case scenario rankings of countries are reported in parentheses.

Table 5: Major differences between best-case and worst-case scenario rankings in the years 1975, 1980, 1990.

Δ 1975		**Δ 1980**		**Δ 1985**		**Δ 1990**	
Oman	8	Oman	7	Oman	8	Oman	7
Saudi Arabia	5	Saudi Arabia	7	UAE	5	Saudi Arabia	5
UAE	4	UAE	5	Saudi Arabia	5	UAE	4
Algeria	3	Algeria	4	Algeria	4	Algeria	4
Kuwait	1	Kuwait	1	Morocco	1	Morocco	3
Iran	1	Morocco	1	Bahrain	0	Tunisia	2
Morocco	0	Iran	0	Kuwait	0	Bahrain	0
Tunisia	-1	Bahrain	-1	Iran	0	Turkey	0
Israel	-3	Tunisia	-1	Israel	-1	Egypt	0
Egypt	-3	Egypt	-2	Tunisia	-1	Yemen	0
Malta	-5	Israel	-3	Egypt	-2	Israel	-1
Turkey	-5	Malta	-4	Turkey	-4	Iran	-1
Syria	-5	Turkey	-4	Malta	-5	Malta	-2
		Jordan	-5	Jordan	-5	Jordan	-5
		Syria	-5	Syria	-5	Syria	-5
						Lebanon	-11

Note: Δ represents the difference between the ranking of a country in the worst case scenario and the ranking in the best case scenario. If Δ is a positive value, then the country ranks in a higher position in the best case scenario when compared to the worst case. Whereas, if Δ is a negative value, then the country ranks in a lower position in the best case scenario when compared to the worst case. The countries rank according from the highest positive difference to the lowest positive difference.

Table 6: Major differences between best-case and worst-case scenario rankings in the years 1995, 1995, 2000, 2005.

Δ 1990		**Δ 1995**		**Δ 2000**		**Δ 2005**	
Syria	6	Syria	5	Syria	6	Syria	8
Lebanon	5	Tunisia	5	Tunisia	4	Tunisia	4
Tunisia	4	Kuwait	2	UAE	2	Malta	2
Malta	2	Oman	1	Algeria	1	UAE	2
Oman	1	Lebanon	1	Yemen	1	Jordan	2
Morocco	1	Algeria	1	Israel	0	Oman	1
Israel	0	Morocco	1	Malta	0	Yemen	1
UAE	0	Yemen	1	Kuwait	0	Israel	0
Algeria	0	Israel	0	Oman	0	Algeria	0
Yemen	0	Malta	0	Lebanon	0	Morocco	0
Jordan	-1	UAE	0	Jordan	0	Egypt	-1
Egypt	-1	Jordan	0	Egypt	0	Djibouti	-1
Bahrain	-2	Egypt	-1	Morocco	0	Kuwait	-2
Iran	-4	Djibouti	-1	Iran	-1	Bahrain	-2
Saudi Arabia	-5	Bahrain	-2	Djibouti	-1	Lebanon	-2
Turkey	-6	Iran	-3	Bahrain	-2	Saudi Arabia	-4
		Saudi Arabia	-5	Saudi Arabia	-4	Iran	-4
		Turkey	-5	Turkey	-6	Turkey	-4

Note: Δ represents the difference between the ranking of a country in the worst case scenario and the ranking in the best case scenario. If Δ is a positive value, then the country ranks in a higher position in the best case scenario when compared to the worst case. Whereas, if Δ is a negative value, then the country ranks in a lower position in the best case scenario when compared to the worst case. The countries rank according from the highest positive difference to the lowest positive difference.

Table 7: Major improvements and deteriorations in the rankings of the official, best-case and worst-case scenario HDI between 1995 and 2000, and 2000 and 2005

Country	**1995-2000 Difference**			**Country**	**2000-2005 Difference**		
	O	**B**	**W**		**O**	**B**	**W**
Algeria	1	0	0	Algeria	0	-1	0
Bahrain	0	0	0	Bahrain	-2	0	0
Djibouti	0	0	0	Djibouti	0	0	0
Egypt	0	1	0	Egypt	0	0	1
Iran	0	1	-1	Iran	0	-1	2
Israel	0	0	0	Israel	0	0	0
Jordan	1	0	0	Jordan	0	1	-1
Kuwait	1	-1	1	Kuwait	2	0	2
Lebanon	0	-1	0	Lebanon	-2	-2	0
Malta	0	0	0	Malta	-1	0	-2
Morocco	0	-1	0	Morocco	0	0	0
Oman	1	0	1	Oman	0	0	-1
Saudi Arabia	-1	0	-1	Saudi Arabia	0	1	1
Syria	-1	1	0	Syria	0	1	-1
Tunisia	0	0	1	Tunisia	0	-1	-1
Turkey	-1	-1	0	Turkey	2	2	0
UAE	-1	1	-1	UAE	1	0	0
Yemen	0	0	0	Yemen	0	0	0

Note: The ranking changes over time are obtained by subtracting the ranking in the previous year from the following year for the official, best-case and worst case scenario HDI. Positive differences suggest a rank improvement over time, whereas the negative differences suggest deterioration in the ranking. "O", "B", and "W" columns represent the ranking changes in the official, best-case scenario and worst-case scenario over time, respectively.

Table 8: Country distributions in different human development groups with the official HDI, the best-case and worst-case scenarios of the HDI in 1975, 1980, 1985, 1990, 1995, 2000, and 2005.

Human dev. level	1975			1980			1985			1990			1995			2000			2005		
	O	B	W	O	B	W	O	B	W	O	B	W	O	B	W	O	B	W	O	B	W
Low ($HDI < 0.5$)	3	1	7	2	0	6	0	0	3	1	1	2	2	1	2	2	1	2	0	0	1
Medium ($0.5 \leq HDI < 0.8$)	9	8	6	12	10	8	14	11	10	11	11	11	11	12	11	11	12	11	11	10	10
High ($0.8 \leq HDI < 0.9$)	1	2	0	1	4	1	1	3	2	4	3	3	5	5	5	4	4	4	6	7	6
Very high ($HDI \geq 0.9$)	0	2	0	0	1	0	0	1	0	0	1	0	0	0	0	1	1	1	1	1	1

This table presents the percentages of countries that fall into four human development groups specified by the United Nations Development Programme in the years 1975, 1980, 1985, 1990, 1995, 2000, and 2005 with the official HDI (represented in the table as O) the best-case scenario (represented in the tables as B), and the worst-case scenario (represented in the table as W). Low, medium, high and very high human development groups consist of countries that have HDI values less than 0.5, between 0.5 and 0.799, between 0.8 and 0.899, and above 0.9 respectively. Between 1975-1990 and 1995-2005 the distribution of the best-case and the worst-case scenarios are obtained by using the weights from the first and the last two rows of Table 2 respectively.