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A UNIFIED FRAMEWORK TO MEASURING INEQUALITY IN THE ARAB COUNTRIES

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Abstract

The purpose of this paper is to apply a general and unified approach to inequality measurement in Arab countries. To this end, a wide class of inequality indices, proposed by Olmedo et al. (2009) and based on the Bonferroni (1930) curve, rather than the Lorenz curve, is used. When local measures of inequality are aggregated using an appropriate weighting system, familiar indices such as the Gini index can be retrieved. The choice of the weighting system yields a variety of inequality measures that depend on which part of the income distribution the overall inequality index is focused. Our framework offers a reassessment of inequality trends in the Arab world. Our results show that whatever the trend of inequality experienced by the selected Arab countries, the poorest people do not seem to be much affected by the changes in the inequality patterns. For instance, when some countries undergo a rise in overall inequality, changes in the inequality experienced by the poorest population are less pronounced. Inversely, when inequality decreases, the richest percentiles seem to become locally more equal than poorer ones. These findings imply that change in the average income of the poorest is generally very low.

ملخص

تستهدف هذه الورقة تطبيق طريقة موحدة علي مقاييس التفاوت الاجتماعي في الدول العربية. و تحقيقا لهذه الغاية، نستخدم طبقة عريضة من مؤشرات التفاوت الاجتماعي، التي وضعها Olmedeo et al. (2009) و قامت علي أساس منحني Bonferroni (1930) ، بدلا من منحني Lorenz. عندما تتجمع كل مقاييس التفاوت المحلية باستخدام نظام وزن مناسب، فان المؤشرات العادية، مثل مؤشر Gini ، يمكن استردادها. اختيار نظام الوزن، يقدم مجموعة مختلفة من مقاييس التفاوت الاجتماعي التي تعتمد علي تحديد الجزء الذي سوف يركز عليه مؤشر التفاوت في توزيع الدخل بشكل عام . هذا الإطار يقدم إعادة تقييم لاتجاه التفاوت الاجتماعي في الوطن العربي. فالنتائج توضح انه مهما كان اتجاه التفاوت الذي تعاني منه الدول العربية المختارة (موضوع الدراسة)، فان أفقر الناس لا يبدوا أنهم قد تأثروا كثيرا بالتغيير في أنماط التفاوت . فعلي سبيل المثال، بينما تحملت بعض الدول ارتفاعا في معدل التفاوت الاجتماعي بوجه عام، فان التغيرات في معدل هذا التفاوت التي واجهها أكثر السكان فقرا كانت اقل وضوحا. و علي العكس، فعندما يقل معدل التفاوت، فان النسبة الأغنى من السكان تبدو وكأنها أكثر مساواة علي الصعيد المحلي من النسبة الأفقر. هذه النتائج توضح أن التغير في نسبة الدخل للفقراء منخفض جدا بوجه عام.

1. Introduction

In economic literature, it is common practice to make spatial and temporal inequality comparisons using Lorenz curves. To summarize Lorenz curves patterns—mainly when they intersect—the Gini index is usually used to rank the living standards distributions in terms of inequality. It is well known, however, that the Gini index is particularly sensitive to the welfare variations which occur in the middle class rather than at the tails of the distribution. That is, Gini index assigns implicitly monotonic weights to local inequality (accumulated up to a given percentile) with a focus on the middle of the income distribution.

To make the analysis performed more wholesome, and to avoid a distorted picture in describing the effectiveness of social policies in reducing overall inequality, analysts have often supplemented the Gini index by other yardsticks of class inequality measures from Atkinson (1970) or Theil (1967). However, as Aaberge (2007) stated "since the Gini coefficient and Atkinson's and Theil's measures of inequality have distinct theoretical foundations, it is difficult to evaluate their capacity as complementary measures of inequality."

To overcome such shortcomings, Olmedo et al. (2009) propose a homogeneous family of inequality indices based on the Bonferroni (1930) curve. As we will see later, the advantages of the proposed family of indices are:

- It allows for assigning flexible weighting schemes to local inequality measures cumulated across the income distribution.
- It comprises the Gini index as a special case.

Thus this paper offers a reassessment of the previous inequality analysis made by Bibi and El-Lahga (2010) while using a unified framework.

The rest of this paper is structured as follows. Section 2 summarizes the analytical framework leading to the s-Gini class of inequality indices. Section 3 presents the Bonferroni class of inequality indices which is general enough to include—among many other families—the s-Gini set of inequality indices. Section 4 reassesses the inequality trend in the Arab region using the Bonferroni curve and related inequality measures. Section 5 concludes the paper.

2. The Lorenz Curve and the Class of s-Gini Indices of Inequality

Let $F(y) = p$ denote the cumulative distribution function (*cdf*) of living standards (incomes for short) giving the proportion of the population with income less than y.[1] Inverting the *cdf* with respect to p yields the quantile function[2]

$$y(p) = F^{-1}(p) \text{ for } p \in [0,1], \quad (1)$$

where $y(p)$ is the income level of individuals whose rank or percentile in the distribution is p. For inequality comparisons, it is usually argued that the Lorenz curve provides a more comprehensive and robust description of income distribution than any summary statistics of disparity may yield. It is often given either by

$$L(p) = \frac{\int_0^p y(q)dq}{\int_0^1 y(q)dq}. \quad (2)$$

[1] The income (or consumption) distribution is suitably adjusted, if need be, for differences in individual needs, family composition, and prices faced.

[2] The principal advantage of working with the quantile function is to normalize the population size to 1. This makes the characterization of the inequality pattern in conformity with the principle of population. It states that if an income distribution is replicated several times, overall inequality is unchanged.

or, equivalently, by

$$L(p) = \frac{1}{\mu_y} \int_0^p F^{-1}(q)dq, \ 0 \leq p \leq 1. \tag{3}$$

where μ_y is the overall mean income, $F^{-1}(p)$ is the inverse of $F(y)$ and $F^{-1}(0) = 0$.

The numerator of (2) sums the income of the lowest p proportion of the population. The denominator sums the income of all. Clearly then, $L(p)$ indicates the cumulative share of income held by the poorest p proportion of the population. If resources were equally distributed across the population, where everyone's income is the mean income μ_y, the Lorenz curve $L(p)$ would be a 45-degree-line, thus labeled the line of full (or perfect) equality.

A mean preserving transfer from a richer person to a poorer one that keeps constant the mean income has the consequence of moving the Lorenz curve closer to the hypothetical line of full equality. This means that if the Lorenz curve $L_y(p)$ of a distribution y lies somewhere below the Lorenz curve $L_x(p)$ of a distribution x, then any inequality statistic that is sensitive to equalizing transfers will unambiguously reveal less disparity in y than in x. However, if the two curves intersect, then the ranking becomes ambiguous and the distributional judgments will depend on which income group the inequality index is more focused.

2.1 The s-Gini class of inequality measures

The most popular inequality index is certainly the Gini coefficient. If we aggregate the deficit between the population share p, and their income share $L(p)$ across all values of p starting from zero to one, we get the middle of the Gini index, such that

$$I_{Gini} = 2 \int_0^1 (p - L(p))\, dp. \tag{4}$$

Now define a single-parameter index of inequality $I(\upsilon)$ as a weighted area underneath the distance between the population share p and the corresponding income share $L(p)$,

$$I(\upsilon) = \int_0^1 \kappa(p,\ \upsilon)\,(p - L(p))\, dp. \tag{5}$$

with the normative weights $\kappa(p, \upsilon)$ defined as $\kappa(p, \upsilon) = \upsilon\,(\upsilon - 1)(1\ \ p)^{\upsilon-2}$ for $\upsilon \geq 1$.

Equation (5) is the well-known single-parameter generalization of the Gini index of inequality (or *s*-Gini) for which the weights $\kappa(p, \upsilon)$ are applied to the distance between the line of perfect equality and the Lorenz curve of incomes.[3]
Following Duclos (2000), $p-L(p)$ can be interpreted as the difference between $1-L(p)$ and $1-p$. $1-L(p)$ shows the proportion of total income which the richer than $y(p)$ hold in the income distribution. $1 - p$ indicates how much these richer individuals represent in the total population; it also measures the proportion of total income that they would have held if income had been distributed equally. $p- L(p)$ is therefore the income share of the rich (whose income is higher than $y(p)$ in excess of what they would have enjoyed under the counterfactual perfect equality of income distribution. Averaging these excess shares at different points of the income distribution, using $\kappa(p, \upsilon)$ as the weighting system, yields $I(\upsilon)$.

The parameter υ may be interpreted as the degree of aversion to inequality in Atkinson's (1970) terminology. For $\upsilon = 1$, no weight is attached to the local gap between the population share and the income share, so that $I(1) = 0$. For $1 < \upsilon < 2$, $\kappa(p, \upsilon)$ is increasing with p, and

[3] See Kakwani (1980), Donaldson and Weymark (1980) and Yitzhaki (1983) for the earliest references to this index.

therefore greater weight is attached to the Lorenz gap $pL(p)$ at the upper distribution. This results in an overall inequality index $I(\upsilon)$ which is more sensitive to the inequality changes that occur among the more affluent of the population. For $\upsilon = 2$, $\kappa(p, \upsilon) = 2$ whatever the value of p is, and $I(2)$ collapses to the standard Gini index given by (4). For $\upsilon > 2$, $\kappa(p, \upsilon)$ is decreasing with p, with an increasing rate as υ increases. Thus, local inequality among the poorest counts much more than local inequality among the richest. Note also that $\kappa(p, \upsilon)$ (for integers $\upsilon > 1$) can be interpreted as the probability that an individual with rank p finds himself the poorest among $\upsilon-1$ individuals randomly selected from the population.[4]

2.2 Relative deprivation and ill-fortune

It is well-known that the standard Gini coefficient can be interpreted as an index of relative deprivation.[5] Duclos (2000) shows that a similar interpretation is valid for the *s*-Gini indices. To see this, let the absolute deprivation of an individual with rank p and income $y(p)$, when comparing himself to an individual with rank r and income $y(r)$, be given by $y(r) - y(p)$ when $y(r) > y(p)$. Otherwise, the individual with rank p feels no absolute deprivation. For the former individual comparing himself with the latter, relative deprivation then equals

$$\delta(p,\ r) = \begin{cases} \frac{1}{\mu_y}\left(y(r) - y(p)\right) & \text{if } r > p, \\ 0 & \text{otherwise.} \end{cases} \qquad (6)$$

This formulation has often been justified by reference to the classical definition of relative deprivation. According to Runciman (1966, p.10), "the magnitude of a relative deprivation is the extent of the difference between the desired situation and that of the person desiring it."

The average deprivation felt by an individual whose rank is p with respect to the whole population is then given by

$$\iota(p) = \int_0^1 \delta(p,\ q)dq. \qquad (7)$$

Combining equations (6) and (7) yield

$$\iota(p) = (1 - L(p)) - (1 - p)\frac{y(p)}{\mu_y} \qquad (8)$$

meaning that the mean deprivation felt by anyone whose rank p lies between 0 (for the richest person of the population whose $p = 1$) and 1 (for the poorest person of the population whose income and rank are close to 0). $\iota(p)$ could be then considered as a local measure of inequality at p.

The next step is to aggregate the $\iota(p)$, $p \in [0,\ 1]$, into a global index using an appropriate weighting system. There are plenty of possibilities. By choosing $\kappa(p, \upsilon)$ as weights, Duclos (2000) shows that

$$I(\upsilon) = \frac{1}{\upsilon}\int_0^1 \kappa(p,\ \upsilon)\iota(p)dp. \qquad (9)$$

Clearly then, if ethical equal weight is attached to the relative deprivation of all individuals, whatever their rank p, we find the standard Gini coefficient, as Yitzhaki (1979) and Hey and Lambert (1980) have already shown for $\upsilon = 2$, i.e.,

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[4] See, for instance, Muliere and Scarsini (1989), Lambert (1993), Duclos (2000), Duclos and Grgoire (2002), and Bibi and Duclos (2007).

[5] Sen (1973), Yitzhaki (1979), Hey and Lambert (1980), Podder (1996).

$$I(\upsilon) = \frac{1}{2}\int_0^1 \iota(p)dp. \tag{10}$$

More generally, for any $\upsilon > 1$, the *s*-Gini indices of inequality are a weighted mean of the individuals' relative deprivation. The ethical weights $\kappa(q, \upsilon)$are a function of the parameter υ. For $\upsilon < 2$, higher weights are granted to the relative deprivation of the more affluent. For $\upsilon = 2$, equal weights are attached to all individuals deprivation, whatever their rank p. As υ becomes very large, more emphasis is put on the perception of ill-fortune of the most deprived segment of the population.

3. The Scaled Conditional Mean Curve and the Bonferroni Class of Inequality Indices

3.1 Framework

An interesting alternative description of the income distribution can be derived by introducing a simple transformation of the Lorenz curve—given by either equation (2) or (3)—as

$$B(p) = \begin{cases} \frac{L(p)}{p}, & 0 < p \leq 1 \\ 0, & p = 0. \end{cases} \tag{11}$$

The curve $B(p)$ is known as the Bonferroni curve or the scaled mean curve. Like the Lorenz curve, it lies between 0 and 1. For any $p > 0$, $B(p)$ is also the ratio between the mean income of the poorest 100p% of the population (i.e., $\frac{1}{p}\int_0^p y(q)dq$) and the overall mean income, μ_y. Thus, the Bonferroni curve gives an alternative ethical judgment of income distribution to that given by Lorenz curve. The values of $B(p)$ refer to relative income levels, while those of $L(p)$ are fractions of the total income held by the poorest 100p% of the population.

The line of perfect equality is defined by $B(p) = 1; \ \forall \ 0 \leq p \leq 1$. However, in the case of extreme inequality, where one person holds the whole income, $B(p)$ will take the value 0 $\forall \ 0 \leq p < 1$, and 1 for $p = 1$. Finally, when incomes are uniformly distributed over an interval $(0; a)$, the Bonferroni curve coincides with the diagonal line joining points (0, 0) and (1, 1).

3.2 Bonferroni curve related inequality

For a given $p \in [0, 1]$ the quantity

$$D(p) = 1 - B(p), \tag{12}$$

can be considered as a local measure of inequality accumulated up to percentile p. Indeed, $D(p)$ measures the relative difference between the whole mean income and the mean income of the poorest 100p% individuals.

The next step is to aggregate the $D(p)$, p 1 $\in$ 1[0, 1], into an overall inequality index (I_B), using an appropriate weighting system $\omega(p)$ such that $\int_0^1 \omega(p)dp = 1$.[6] There are plenty of possibilities. For instance, setting $\omega(p) = 1 \ \forall \ p$ yields the Bonferroni index of inequality,

$$I_B = \int_0^1 (1 - B(p))\, dp = \int_0^1 \frac{1}{p}(p - L(p))\, dp. \tag{13}$$

The index I_B lies between values zero and one for perfect equality and extreme inequality, respectively. However, despite the fact that such index has attractive proprieties, it has been seldom used in distributive analysis. As can be seen from equation (13), the I_B index assigns

[6] This approach underlies implicitly or explicitly several contributions to the inequality literature, in particular those of Mehran (1976) and Yitzhaki (1983).

more weight to local inequality on the left-hand-side of the income distribution. Such a weighting scheme introduces a specific value judgment in the measure of inequality, since it focuses on the most deprived individuals.

One can think that if more flexible weighting schemes could be found to aggregate the distance (1 $B(p)$), a variety of inequality measures—depending on which income group the focus is put—may result. In a recent paper, Olmedo et al. (2009) propose a new class of inequality indices, which assign a non-monotonic weight to local inequality. The new class is obtained by applying the probability density of the β distribution to the distance (1 $B(p)$). Denote those weights by $\omega_{s,t}(p)$, over the interval [0, 1] where

$$\omega_{s,t}(p) = \frac{1}{\int_0^1 p^{s-1}(1-p)^{t-1}dp}\, p^{s-1}(1-p)^{t-1}, \tag{14}$$

and where s and t are non-negative parameters which characterize the shape of the β density. It results in β class of inequality indices defined as

$$I(s,t) = \int_0^1 \omega_{s,t}(p)(1-B9p))dp. \tag{15}$$

Given the proprieties of the β density function, it can be shown that for $0 < s < 1$ and $0 < t < 1$, more weights are assigned to local inequality in the tails of income distribution (i.e. $\omega_{(s,t)}(p)$ is U shaped). For $0 < s < 1$ but $t \geq 1$ (respectively $s \geq 1$ but $0 < t < 1$), the weighting system is more focused on the poorest (richest) population given that $\omega_{s,t}(p)$ is decreasing and convex (increasing and convex). When both s and t are greater than one and closer to each other, greater weights are assigned to middle incomes.

Clearly then, by varying parameters s and t, one can obtain a wide class of inequality measures based on a unified theoretical framework. For instance, if $(s, t) = (1, 1)$, then $I(1, 1)$ corresponds to the Bonferroni index given by (13). However, when $(s, t) = (2, 1)$, we obtain the Gini index described by (4).

Further, the $I(s, t)$ is large enough to encompass—for some particular values of either s or t — families of inequality indices that generalize the Gini index or the Bonferroni yardstick. Setting $s = 2$ and $t = \upsilon$ 1, we obtain the s-Gini class of inequality measures as defined by (5), i.e.

$$\begin{aligned} I(2,\ t) &= t(t+1)\int_0^1 p(1-p)^{t-1}\,(1-B(p))\,dp \\ &= t(t+1)\int_0^1 (1-p)^{t-1}\,(p-L(p))\,dp \\ &= (v-1)v\int_0^1 (1-p)^{v-2}\,(p-L(p))\,dp \\ &= I(v) \end{aligned} \tag{16}$$

When instead $s = 1$, we obtain a first generalization of the Bonferroni index suggested by Imedio et al. (2008),

$$I(1,\ t) = t\int_0^1 (1-p)^{t-1}\,(1-B(p))\,dp. \tag{17}$$

The second way to generalize the Bonferroni index consists of fixing t to 1 for any $s \geq 1$. This way was followed by Aaberge (2007) who suggested the $I(s, 1)$ family of inequality indices,

$$
\begin{aligned}
I(s,\ 1) &= s\int_0^1 p^{s-1}\,(1-B(p))\,dp, \\
&= s\int_0^1 p^{s-2}\,(p-L(p))\,dp.
\end{aligned} \tag{18}
$$

For $s = 1$, $I(s,\ 1)$ is simply the Bonferroni index while for $s = 2$, $I(s,\ 1)$ reduces to the Gini index.

4. Empirical Illustration

In this section, we illustrate the use of the $I(s,\ t)$ family of indices, with data constructed from the Lorenz curve coordinates, as discussed in Bibi and El-Lahga (2010). For each country, we calculate 15 indices by using different combinations of parameters s and $t \in \{1, 2, 3, 4, 5\}$

Tables 1 to 10 show the estimation results of these indices, using all available data for each country. All results are presented as a triangle where its vertex coincides with the Bonferroni inequality index, i.e. $I(1,\ 1)$. Under each estimated index, we provide the relative variation of inequality when moving from a period t_1 to another t_2. Further, on the one hand, we recall that as we move from the top to the bottom left corner of the triangle, reported indices put increasingly more weight to local inequality of the poorest percentiles. The same remark applies when we move from the left to the right of each row. On the other hand, when we move from the vertex of the triangle to the bottom right corner, indices become increasingly more sensitive to local inequality of the upper part of the distribution.

Looking at Tables 1 to 10, a number of interesting findings emerge. For instance, whatever the trend of inequality, the poorest people do not seem to be much affected. Indeed, absolute values of relative variations of indices that focus on the poorest are generally smaller than those recorded by the indices that give more weight to the richest. Thus, when overall inequality increases, the rise in local inequality among the poorest percentiles is less pronounced. Conversely, when inequality decreases, the richest percentiles seem to benefit more from this improvement than poorer ones. These findings imply that changes in the average income of the poorest are generally very low. An interesting exception is that of Mauritania during the periods 1987–1993 and 2000–2004 where indices focusing on the rich seem to move in the opposite direction from those that focus on the poor. In Table 6, we can see that between 2000 and 2004, the $I(1,\ 5)$ index declines by about 2.75 percent while the index $I(5,\ 1)$ increases by 7.10 percent.

5. Conclusion

There is clearly a need among policymakers for meaningful descriptive and normative families of inequality measures. Such families should encompass a variety of assumptions concerning the weight to be assigned for each income group. At the same time, these families should have a common theoretical framework in order to improve our understanding of the origins of change in inequality over time and between different socioeconomic groups.

For this purpose, we have selected the β class of inequality measures suggested by Olmedo et al. (2009) to perform temporal inequality comparisons in some Arab countries. This class is large enough to encompass several well-known families of inequality statistics commonly followed in economic research. Our results show that whatever the trend of inequality experienced by the selected Arab countries, the poorest people do not seem to be much affected by the changes in the inequality patterns. For instance, when some countries underwent a rise in overall inequality, changes in inequality experienced by the poorest population were less pronounced. Inversely, when inequality decreased, the richest percentiles seemed to become locally more equal than poorer ones. These findings imply that the change in average income of the poorest is generally very low. The poor segment of the population is often saved from economic recession periods but usually do not benefit enough (or as much as the rich) from growth periods of economic prosperity.

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Table 1: Algeria 1988, 1995

				I(1.1) .504 ; .467 **-7.297%**				
			I(1.2) .061 ; .581 **-4.794%**		I(2.1) .398 ; .353 **-11.136 %**			
		I(1.3) .660 ; .635 **-3.793%**		I(2.2) .510 ; .473 **-7.382%**		I(3.1) .341 ; .294 **-13.942%**		
	I(1.4) .690 ; .668 -3.282%		I(2.3) .568 ; . 536 **-5.658%**		I(3.2) .452 ; .409 **-9.550%**		I(4.1) .304 ; .255 **-16.116%**	
I(1.5) .712 ; .690 **-2.973%**		I(2.4) .606 ; .577 **-4.730%**		I(3.3) .512 ; .475 **-7.303%**		I(4.2) .412 ; .365 **-11.412%**		I(5.1) .278 ; .228 **-17.863%**

Table 2: Djibouti 1996, 2002

				I(1.1) .486 ; .513 **5.593%**				
			I(1.2) .606 ; .628 **3.600 %**		I(2.1) .367 ; .399 **8.885%**			
		I(1.3) .665 ; .681 **2.434%**		I(2.2) .488 ; .521 **6.778%**		I(3.1) .306 ; .339 **1.564%**		
	I(1.4) .702 ; .713 **1.614 %**		I(2.3) .554 ; .584 **5.551%**		I(3.2) .422 ; .458 **8.387%**		I(4.1) .268 ; .299 **11.709%**	
I(1.5) .728 ; .735 **.997%**		I(2.4) .597 ; .625 **4.626%**		I(3.3) .488 ; .524 **7.247%**		I(4.2) .378 ; .413 **9.369%**		I(5.1) .240 ; .270 **12.630%**

Table 3: Egypt 1990, 1995, 1999, 2004

				I(1.1) .416 ; .387 ; .414 ; .410 **-7.05% ;6.90% ;-.92%**				
			I(1.2) .513 ; .475 ; .503 ; .501 **-7.34%;5.87% ;-.35%**		I(2.1) .320 ; .299 ; .324 ; .319 **-6.59%;8.53% ;-1.81%**			
		I(1.3) .560 ; .517 ; .545 ; .545 **-7.55%;5.42% ;-.05%**		I(2.2) .419 ; .390 ; .418 ; .413 **-6.79%;7.07% ;-1.14%**		I(3.1) .271 ; .253 ; .278 ; .271 **-6.44%;9.65% ;-2.32%**		
	I(1.4) .589 ; .544 ; .572 ; .572 **-7.68%;5.16 %;.14%**		I(2.3) .471 ; .438 ; .466 ; .463 **-7.06%;6.4% ;-.74%**		I(3.2) .366 ; .343 ; .370 ; .364 **-6.45%;7.93% ;-1.65%**		I(4.1) .239 ; .224 ; .247 ; .241 **-6.44%;1.53%;-2.66%**	
I(1.5) .610 ; .562 ; .590 ; .592 **-7.77%;4.98% ;.27%**		I(2.4) .506 ; .469 ; .497 ; .495 **-7.25%;6.02% ;-.47%**		I(3.3) .420 ; .392 ; .419 ; .414 **-6.70%;7.08% ;-1.21%**		I(4.2) .330 ; .310 ; .337 ; .330 **-6.23%;8.65% ;-2.00%**		I(5.1) .216 ; .202 ; .225 ; .218 **-6.51%;11.25%;-2.91%**

Table 4: United Arab Emirates 2008

				I(1.1)				
				.502				
			I(1.2)		I(2.1)			
			.610		.395			
		I(1.3)		I(2.2)		I(3.1)		
		.659		.511		.337		
	I(1.4)		I(2.3)		I(3.2)		I(4.1)	
	.689		.570		.452		.298	
I(1.5)		I(2.4)		I(3.3)		I(4.2)		I(5.1)
.709		.608		.514		.410		.270

Table 5: Jordan 1986, 1992, 1997, 2002, 2006

				I(1.1) .47;.54;.46;.49;.48 **15.02;-13.25;6.52;-3.67**				
			I(1.2) .57;.64;.57;.60;.58 **12.24 ;-11.66;6.29 ;-3.81**		I(2.1) .36;.43;.36;.39;.37 **19.42;-15.61;6.87 ;-3.45**			
		I(1.3) .62;.69;.61;.65;.63 **11.12 ;-1.70;5.96 ;-3.80**		I(2.2) .47;.55;.47;.50;.48 **15.18 ;-14.08;7.15 ;-3.84**		I(3.1) .30;.37;.31;.33;.32 **22.73 ;-16.72;6.66 ;-3.15**		
	I(1.4) .65;.72;.64;.68;.65 **1.53 ;-1.03;5.66 ;-3.74**		I(2.3) .53;.60;.52;.56;.54 **13.24 ;-13.05;7.04;-4.00**		I(3.2) .42;.49;.41;.44;.43 **17.66 ;-15.35;7.30 ;-3.65**		I(4.1) .27;.33;.27;.29;.28 **25.38 ;-17.39;6.33 ;-2.90**	
I(1.5) .67;.73;.66;.70;.67 **1.18 ;-9.54 ;5.47 ;-3.68**		I(2.4) .57;.64;.56;.60;.57 **12.19 ;-12.32 ;6.85 ;-4.03**		I(3.3) .48;.55;.47;.51;.49 **15.12 ;-14.34;7.38 ;-3.92**		I(4.2) .37;.45;.38;.40;.39 **19.83 ;-16.19;7.24 ;-3.41**		I(5.1) .24;.30;.25;.26;.26 **27.56 ;-17.84; 5.99 ;-2.70**

Table 6: Jordan 1986, 1992, 1997, 2002, 2006

				I(1.1) .57;.59;.49;.50;.50 **3.76 ;-17.16;2.65 ;-1.29**				
			I(1.2) .70;.69;.61;.62;.60 **-2.08 ;-11.48;1.50 ;-2.65**		I(2.1) .44;.50;.37;.39;.39 **13.09 ;-25.01;4.53 ;.87**			
		I(1.3) .76;.73;.66;.67;.65 **-4.40;-8.83 ;.70 ;-2.89**		I(2.2) .58;.60;.50;.51;.50 **4.00 ;-17.89;3.65 ;-2.04**		I(3.1) .37;.44;.31;.33;.34 **2.23 ;-29.83;5.22 ;3.15**		
	I(1.4) .80;.75;.70;.70;.68 **-5.61 ;-7.25 ;.12 ;-2.86**		I(2.3) .65;.65;.56;.58;.56 **.08 ;-14.30;2.90 ;-2.98**		I(3.2) .50;.55;.43;.45;.45 **9.06 ;-22.15;4.63 ;-.84**		I(4.1) .32;.41;.27;.29;.30 **26.05 ;-33.30;5.54 ;5.23**	
I(1.5) .82;.77;.72;.72;.70 **-6.36 ;-6.17 ;-.34;-2.76**		I(2.4) .70;.69;.60;.62;.60 **-2.09 ;-12.09;2.30 ;-3.34**		I(3.3) .58;.61;.50;.52;.50 **3.99 ;-18.05;4.00 ;-2.34**		I(4.2) .45;.52;.38;.40;.41 **13.41 ;-25.36;5.17 ;.45**		I(5.1) .29;.38;.244;.26;.28 **3.99 ;-35.99;5.68 ;7.11**

Table 7: Morocco 1984, 1990, 1998, 2000, 2007

				I(1.1) .50;.50;.50;.51;.51 **.09;1.18 ;1.71;-.34**			
			I(1.2) .60;.60;.61;.61;.61 **.23;.99 ;.96;-.50**		I(2.1) .39;.39;.39;.41;.40 **-.11; 1.47 ; 2.88 ; -.11**		
		I(1.3) .65;.65;.66;.66;.66 **-.285 ;1.2 ;.58 ;-.45**		I(2.2) .50;.51;.51;.52;.52 **1.57 ;.45;1.93 ;-.61**		I(3.1) .33;.33;.34;.35;.35 **-1.38;2.26 ;3.61 ;.25**	
	I(1.4) .68;.68;.69;.69;.69 **-.78;1.43;.36 ;-.37**		I(2.3) .56;.57;.57;.58;.57 **1.53 ;.35;1.40;-.74**		I(3.2) .44;.45;.45;.46;.46 **1.63;.57;2.60;-.44**		I(4.1) .30;.29;.30;.31;.31 **-2.87;3.14 ;4.12 ;.60**
I(1.5) .71;.70;.71;.71;.71 **-1.19;1.64 ;.21;-.30**		I(2.4) .60;.60;.61;.61;.61 **1.17 ;.46;1.05;-.73**		I(3.3) .50;.51;.51;.52;.52 **2.18 ;.15 ;2.01;-.77**		I(4.2) .40;.41;.41;.42;.42 **1.17;.92;3.09;-.16**	

Table 8: Syria 1997, 2003, 2007

				I(1.1) .440;.475;.436 **7.825; -8.260**				
			I(1.2) .543;.576;.534 **6.050 ; -7.368**		I(2.1) .338;.374;.338 **1.682 ;-9.637**			
		I(1.3) .593;.623;.580 **5.054 ;-6.872**		I(2.2) .444;.483;.441 **8.705 ;-8.644**		I(3.1) .284;.319;.286 **12.227 ;-1.388**		
	I(1.4) .623;.650;.608 **4.396 ;-6.543**		I(2.3) .501;.539;.495 **7.506 ; -8.064**		I(3.2) .388;.427;.387 **1.256 ;-9.376**		I(4.1) .250;.283;.252 **13.246 ;-1.898**	
I(1.5) .644;.670;.627 **3.919 ; -6.301**		I(2.4) .538;.574;.530 **6.685 ;-7.673**		I(3.3) .446;.486;.444 **8.992 ; -8.756**		I(4.2) .349;.388;.350 **11.335 ;-9.895**		I(5.1) .225;.257;.228 **13.987 ;-11.277**

Table 9: Tunisia 1980, 1985, 1990, 1995, 2000, 2005

				I(1.1) .55;.54;.52;.53;.52;.52 **-1.48 ;-4.76 ;2.68 ;-1.94 ;.70**			
			I(1.2) .67;.65;.63;.64;.63;.63 **-2.60 ;-2.29 ;1.32 ;-1.64 ;.07**		I(2.1) .43;.43;.40;.42;.41;.41 **-.44 ; -7.26 ; 4.06 ; -2.17 ; 1.40**		
		I(1.3) .72;.70;.69;.69;.68;.68 **-2.90 ;-1.81 ;1.00 ;-1.49 ;-.05**		I(2.2) .56;.55;.52;.54;.53;.53 **-1.00 ;-5.19 ;3.10 ;-2.23 ;.74**		I(3.1) .37;.37;.34;.35;.35;.35 **-.02 ; -8.81 ; 4.80 ; -2.12 ; 1.91**	
	I(1.4) .75;.73;.72;.72;.71;.71 **-2.89 ;-1.80 ;.99 ;-1.49 ;-.05**		I(2.3) .62 ;.59; .61; .59;.59 **-1.53 ;-4.06 ;2.52 ;-2.16 ;.49**		I(3.2) .49;.49;.46;.48;.47;.47 **-.34 ;-6.60 ;3.85 ;-2.32 ;1.04**		I(4.1) .33;.33;.30;.31;.31;.31 **.14 ; -9.91 ; 5.29 ; -2.01 ; 2.35**
I(1.5) .77;.75;.74;.74;.73;.73 **-3.11 ;-1.46 ;.75 ;-1.37 ;-.14**	I(2.4) .67;.65;.63;.64;.63;.63 **-1.89 ;-3.35 ;2.10 ;-2.05 ;.38**		I(3.3) .56;.56;.53;.55;.53;.54 **-.88 ;-5.31 ;3.27 ;-2.35 ;.71**		I(4.2) .45;.45;.41;.43;.42;.43 **.11 ;-7.68 ;4.34 ;-2.30 ;1.33**		I(5.1) .30;.30;.27;.28;.28;.28 **.15 ;-1.75;5.66 ;-1.90 ;2.73**

Table 10: Yemen 1992, 1998, 2006

				I(1.1) .51;.45;.51 **.51;.45;.51**				
			I(1.2) .623;.558;.614 **-1.51;1.00**		I(2.1) .394;.335;.406 **-15.15;21.20**			
		I(1.3) .678;.612;.663 **-9.71 ;8.34**		I(2.2) .514;.449;.515 **-12.61;14.55**		I(3.1) .334;.277;.351 **-17.10;26.59**		
	I(1.4) .71;.65;.69 **-9.27 ;7.46**		I(2.3) .58;.51;.57 **-11.35;11.63**		I(3.2) .45;.39;.46 **-14.21;18.42**		I(4.1) .30;.24;.31 **-18.57;3.96**	
I(1.5) .73;.67;.71 **-8.99 ;6.944**		I(2.4) .62;.55;.61 **-1.62;9.98**		I(3.3) .52;.45;.52 **-12.67;14.67**		I(4.2) .41;.34;.42 **-15.51;21.68**		I(5.1) .27;.21;.29 **-19.73;34.67**